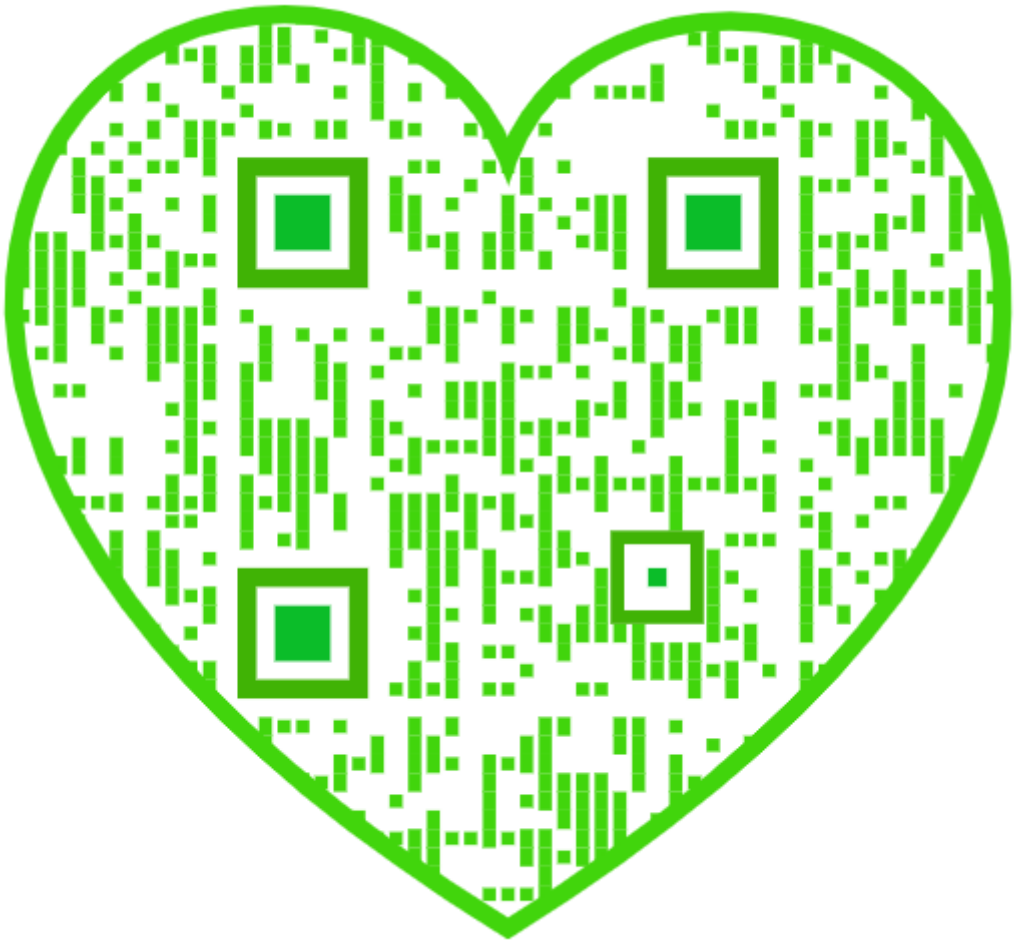
HENDERSON'S HANDBOOK OF THE GRASSES OF GREAT BRITAIN AND AMERICA.



HENDERSON'S

HAND-BOOK

OF

THE GRASSES

OF

GREAT BRITAIN AND AMERICA.

Their Generic and Specific Character; Comparative Nutritive Value; Soils Best Adapted for their Cultivation; Proper Times and Methods of Sowing; Approved Mixtures and Quantities Usually Sown; After Management, etc.

BY

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PREFACE.

THE design or plan of this work is simply the illustration of an idea which I have long entertained of the requirements of a book on the grasses that would meet the wants and merit the approval of the practical farmer. With this object in view, I have made a selection of the most valuable of the true and artificial grasses, and brought them out, as it were, in bold relief, in the first and second parts of this work, thus bringing them in close proximity to each other for the purpose of a close and thorough examination of their respective merits. The analyses given are those made by Professor Way, of the Royal Agricultural Society, and are universally acknowledged to be the most reliable ones ever made of the grasses. By a careful comparison of the analysis the reader is made acquainted with the comparative nutritive values of the grasses analyzed. Following this is given the history of most of the valuable grasses from the different periods of their introduction until the present time, and the experience and directions for their successful cultivation by eminent practical agriculturists in both countries. In order to avoid confusion in the names of genera and species, and to assist in making the natural system the standard one of this country, also to make this work acceptable in part to the student of Botany. In

the arrangement of genera and species. Part third of this work I have followed, as Mr. Flint has done in his valuable treatise, the natural order adopted by Professor Gray, to whose Manual of Botany I refer the student for a specific description of the grasses of no agricultural value. All grasses having an agricultural value have their generic and specific character given in this work. And lastly I have given suitable mixtures for various soils.

Although much has been said and written on the subject of grass culture, there still remains a great work to be accomplished in this important industry.

Perrennial grasses constituting rich, permanent meadows and pastures are generally acknowledged to be the true basis of the agricultural prosperity of a country, consequently the want of these must be a serious inconvenience and drawback to agricultural communities. What must then be thought of the practice, followed in many sections of the country of making a speciality of growing Timothy, which is a short-lived grass, and almost totally unfit for permanent pasture, to the exclusion of other grasses, many of them equaling it for hay crops, but all surpassing it in permanency of meadow and pasturage.

If my humble efiorts will have the effect of inducing farmers to give mixtures of those valuable grasses a fair trial, which must result in individual wealth and general prosperity, clothing the fields with luxuriant verdure and giving the country an appearance which would betoken enlightened agricultural progress, I will not have labored in vain.

JOHN HENDERSON.

Northport, L. I., June, 1875.

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CHAPTER I.

MEADOW CAT'S-TAIL OR TIMOTHY.

Phleum Pratense—Specific Character.

Tall; spike cylindrical: elongated; glumes ciliate on the back, tipped with a short bristle, leaves long, flat, rough, with long sheaths; roots perrennial, fibrous on moist soils, on dry ones often bulbous. Grows best on damp, peaty soils. Flowers end of June and ripens seeds in July.

WAY'S ANALYSIS.

100 parts as taken green from the field, June 13th.

Water	57.21
Albuminous, or flesh forming principles	4.86
Fatty matters	1.50
Heat producing principles, starch, sugar, gum, etc.	22.85
Woody Fibre	11.32
Mineral matter or ash	2.26
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous, or flesh forming principles	11.36
Fatty matter	3.55
Heat producing principles, starch, sugar, gum, etc.	53.35
Woody Fibre	26.46
Mineral matter or ash	5.28
	100.00

Herds Grass, as it was then called in the Eastern States, was first introduced and brought into cultiva-

no value to him, whilst others constitute the foundation of his riches, as they are the staff of life to the most valuable of the domestic animals. Though the numerous species and varieties of grasses differ so widely from each other in value, yet the simplicity which pervades their whole structure is too great to afford any certain marks of distinction without having recourse to particular rules, made from a consideration of those parts of their structure which are not subject to vary from culture or change of situation.

The botanical, or discriminating characters, of which these rules consist, are often minute, and sometimes perplexing even to professed botanists. To those, therefore, who have made botany no part of their study, the number and difference of value of all the species and varieties of grass will appear comparatively small, and the necessity and importance of a particular selection proportionally little. The natural consequence resulting from this would be confusion in the choice of seed, all of which is obviated by attention to the characters of each species; hence the necessity of giving the specific characters of all the valuable grasses treated of in this work.

The past winter has added another proof to the many already experienced of the necessity that exists throughout the Northern States of feeding cattle under shelter from five to six months of the year; and although corn-fodder forms a considerable portion of our means, yet we are mainly dependant on the grasses for the better part of our supplies. It is therefore evident that grass culture demands more attention in the future than has hitherto been given it.

As it is necessary for a proper understanding of the subject, I shall endeavor to give a brief history

of all the useful grasses. It is my purpose to make each article as complete as possible so as to fix an indellible impression of the character, etc., of each species of grass on the mind of the reader.

After mature deliberation, the form I have adopted, viz.: Name of Grass, Specific Character, Analysis, History, etc., appears to be the best adapted for that purpose. I have been familiar with the theory and practice of grass culture for the last forty years, part of which time I have given it my special attention. For the purpose of being able to communicate valuable information on the subject of the grasses to subscribers and purchasers of this work, I have upwards of thirty species of the best grasses of Europe and America growing finely in my experimental grounds at the present time.

The subject of laying down lands to grass, whether for lawns, meadows or pasture, also the selection, mixture and sowing of grass seed, will receive careful attention, and be treated of in the concluding chapters of this work.

GRASSES OF GREAT BRITAIN AND AMERICA.

INTRODUCTION.

THE most distinguished agriculturists and farmers of America agree in opinion that the knowledge of the comparative merits and value of all the different species and varieties of grasses, and consequently of the best mode of cultivating them, is very much behind that of the other branches of practical agriculture. Timothy (*Phleum Pratense*) has received more attention than all the other grasses combined; it is indebted, most probably, for this distinction, to its value as a hay crop and the preference given it in the markets of large cities. Orchard Grass (*Dactylis Glomerata*,) however, is speedily superceding it in many sections of the country through the successful practice and recommendation of advanced and enlightened farmers.

"Grass," says an eminent professor, "commonly forms one single idea; and a farmer, when he is looking over his fields, does not dream that there are upwards of three hundred species of grasses, of which thirty or forty may be at present under his eye." In this age of progress it is no longer excusable that the humblest farmer should be ignorant of the above facts. Comparatively speaking, some grasses are of

tion in the State of Maryland, by Timothy Hanson, a native of one of the New England States, who built the first grist mill on Jones' Falls, now forming a part of the city of Baltimore, about the year 1720. When it first came into notice it was called Timothy Hanson's Grass, and sold in "Baltimore Town," by that name. The character and name of this grass was soon established by the fine crops of it grown on the Hanson Farm, and the name it received then, will, in all probability, forever adhere to it. It is supposed to have been introduced into England from Virginia, about the year 1760, and for years afterwards its cultivation was confined to moist and newly reclaimed, peaty or moorish soils.

The first general notice taken of it was after the Woburn experiments, made by George Sinclair, in 1824, when it was found to possess the advantage of affording double the quantity of nutriment when its seeds were ripe that it did if cut when in flower, hence it presented an increased stimulous to its cultivation from its seeds, being procured without its being lessened in value as a hay crop. It was considered after this discovery to be equal to any of the Rye grasses. Yet I am not aware of much progress being made in its cultivation until the year 1850, since which time its cultivation has become general in the United Kingdom. The analysis made of it by Professor Way, and the well known preference given to Timothy hay in the American markets, have no doubt contributed largely to the experimental cultivation of it by the English farmers. But the excellent hay made from a mixture of the various grasses, and particularly rye grass, which is always for sale in the markets of England, and held in high estimation by

turf-men, will probably operate strongly against Timothy ever monopolizing too large a share of attention in that country.

In the New England and Middle States, from an early period down to the present day, Timothy has been cultivated almost exclusively for sale in the markets of the large cities. The preference given to this hay, is no doubt in a great measure owing to its attractive uniform appearance when well cured. The little waste with which it may be handled, and the easy means afforded of judging pure Timothy, compared with other kinds offered for sale, are considerations of no little consequence to dealers and owners of horses in cities.

Similar reasons have operated in favor of Rye grass hay, for two centuries in English markets. For hay crops, both in regard to quantity and quality, Timothy is perhaps unequalled, but it is a great impoverisher of the soil, each ton of hay, as shown by analysis, taking from the land at least one hundred and fifty pounds of potash, &c., an equivalent to which must be returned in annual top dressings, or else in a few years the land becomes exhausted, and the Timothy disappears. A late writer in the *Country Gentleman*, W. J. F., Monroe Co., N. Y., remarks, "The roots of Timothy grass are fine and near the surface, often in the second year forming a perfect mat. Its net-work of roots takes only the strength of the surface soil; but they do that thoroughly, while all beneath is left hard and not permeable to air and light. In such conditions soils gain nothing if they do not absolutely tend to sterility. In two or three years the surface is exhausted, and unless annually overflowed or artificially manured, the

Timothy begins to die out. If it is then plowed and seeded with Timothy again, this exhausted soil is turned to the bottom of the furrow, and the inert soil brought up to have the process repeated. A few years of such treatment will take the virtue out of any land, provided Timothy is grown alone."

The experience of farmers in different parts of the country, in the cultivation of Timothy, is as diverse as the soils on which it is grown. While many of the theories advanced by them may be correct to the extent of their own observations, there are circumstances of soil and climatic influences which tend to produce results not always accounted for in their calculations.

For instance, in the dairy district proper of Herkimer county, New York State, where the land is moist with a rich surface underlaid with a compact subsoil, Timothy can be grown to advantage under systems of treatment that would not answer in Suffolk county, Long Island. My observations and experience in the growth of Timothy on the Island leads me to favor the practice of allowing it to stand until the seed is well formed. My reasons are as follows, viz.:

1st. The analysis made by Sinclair and Way both agree in showing that this grass affords double the quantity of nutriment when its seeds are ripe that it does if cut when in flowers. 2nd. That about the time the seed begins to ripen, the rains of August are drawing neas. And 3rd. That the stubble roots of a matured perrennial plant will suffer less from the heated rays of a July sun than those of an immatured one. And lastly, the ripe seeds falling from the hay

on vacancies over the ground will make up whatever deficiences that may have existed in the sward.

The soils best adapted for the growth of Timothy are moist, peaty or loamy, although there are fair crops grown on light, gravelly soils, by heavy manuring, yet there are other grasses far more suitable for such lands. As it is generally conceded that Timothy is only profitable to grow as a marketable hay crop, to make it as remunerative as possible, is the object of the farmer, which can only be accomplished by the selection of suitable soils, liberal manuring, thorough pulverization and cleansing of the land.

The common practice is to seed down with wheat in September, or later with rye, at the rate of one peck, or 11 pounds of Timothy seed per acre ; it is sometimes sown alone, in August or September, on land which has been previously well prepared, at the rate of 30 pounds per acre.

Either a chain harrow or a grass one should be used in covering the seed, in order to give the proper depth of covering.

The practice of sowing red clover with Timothy, is not approved of, on account of the different seasons of flowering; Timothy being later than red clover. But the mammoth or alsyke clovers obviate this difficulty, as the two latter flower or mature about the same time of the Timothy, and during their growth, the clover retains the dew and moisture longer and thus preserves the Timothy from drought and heat, which would otherwise affect it. As soon as the first and second joints of the grass begins to turn it should be cut, and the machine so guaged, as not to cut below the second joint above the tuber; this is of

the greatest importance, as many a fine field of Timothy has been ruined by close mowing in the hot days of July. It would well repay a top dressing immediately after the hay has been removed off the stubble. All stock should be kept off during the remainder of the season, and the grass allowed to take its natural course until it again arrives at maturity.

The close cropping of the aftermath of Timothy by horses, sheep, or even cattle, is fatal to the tubers of the plant, which require the aid of the green portion or leaves to preserve its vitality and strength during the winter, hence it is quite evident that Timothy alone is not adapted for permanent pasture under any circumstances.

A mixture of Timothy, however, with the seeds of other grasses for permanent pasture, would give variety of food both in pasture and meadow, an important thing for stock of all kinds. The quantity of clover usually sown on a Timothy brairdin the spring, is from 6 to 8 pounds per acre.

CHAPTER II.

ROUGH COCK'S-FOOT, OR ORCHARD GRASS.

Dactylis Glomerata—Specific Character.

Rough, rather glaucous, (3 foot high) leaves broadly linear; branches of the panicle naked at the base;

spikelets 3 to 4, flowered. Root perrennial. Flowers in June and seeds ripens in July. Common in fields, especially shade.

WAY'S ANALYSIS.

From 100 parts, as taken from the field June 13th.

Water	70.00
Albumiuous or flesh forming principles	4.06
Fatty matter	.94
Heat producing principles, starch, sugar, gum, &c...	13.30
Woody fibre	10.11
Mineral matter or Ash	1.59
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	13.53
Fatty matter	3.14
Heat producing principles, starch, sugar, gum, &c...	44 32
Woody fibre	33.70
Mineral matter or Ash	5.31
	100.00

This valuable (though much neglected) grass is indigenous to the soil of America, and from its adaptability to various soils, its early and late growth, luxuriant foilage and nutritive qualities, is well entitled to an equality with any grass, either native or foreign, which is being cultivated in this country.

It appears that this grass was introduced into England previous to 1760. It forms one of the most common grasses in English pastures, and enters either more or less into all mixtures for meadow or pasture, but is used very sparingly in mixtures for lawns. It has been found highly useful as an early sheep feed, and it grows well in winter. It grows in mid-sum,

mer in a drought when everything else is parched or burnt up.

In the Norfolk *Agriculturist* it is stated that Sir M. Martin, observing by an experiment, that this grass grew four inches in less than three days, determined to attend more particularly to it, he remarked that when sheep were let out of a fold they ran over every thing to get at a baulk that was full of it, and there ate it in preference to other grasses; on an examination of the roots, they were perceived to be so strong that some suspicion was entertained that they might exhaust the soil, and the land was therefore sown for a trial. The results were quite satisfactory that all apprehensions of the kind were ill founded.

The late Judge Peters, of Pennsylvania, one of the most distinguished agriculturists of his time, said of the Orchard grass, in 1817, "I know its value, having constantly sown it for a period of 40 years. All beasts are fond of it, both as pasture and hay; it is permanent, whilst clover is short lived; it grows in the shade luxuriantly, hence it is called Orchard grass; any soil is suitable if not wet. The Orchard grass should be cut for hay when the panicles are fairly formed, and this is the time the clover begins to turn. For seeds it must be ripe, but some let it stand too long for that purpose. It is best to raise a spot purposely for seed, whereof it furnishes great plenty."

The *Rural Advertiser* says of it, "Many of our best farmers who feed all their hay, and do not depend on selling it, value a mixture of Orchard grass and red clover more than any other grasses. It makes a highly nutritious hay and is much relished by stock of all kinds. Clover hay, (so called) that is hay

where clover predominates, so far as we know, is seldom cut, for the reason that it grows too rank and coarse first year after wheat, unless for soiling. Red clover is a biennial plant, and every farmer experiences that it is only after the second year from wheat that the timothy has much time to develop, and that makes the article so saleable in market under the name of timothy hay.

Orchard grass, when sown with clover, obviates this difficulty, grows as rapidly as clover, starts in the spring as early, and by this similarity of habit makes a suitable grass to mix with it. For pasturage we greatly value Orchard grass, for three reasons: It stands a drought better than any other, will bear heavier stocking, and comes forward in the spring very early. We have often been surprised to observe how quickly Orchard grass recovers and grows after being closely cropped; a week or ten days of summer growth will make quite a good pasturage. Orchard grass, also, by its great amount of fibrous roots, tends to improve instead of impoverish the soil, and we have observed that an Orchard grass sod generally turns up a good dark color on being plowed. It is not at all fit for a lawn, as it sometimes grows in bunches or tusseks, especially when sown thin. The proper quantity, when sown alone, is two bushels to the acre; when sown with clover one bushel is sufficient. Perhaps there are no other two grasses that can be sown together with so great advantage as red clover and Orchard grass, by their union the crop is nearly double what it would be if each were sown separately; they grow and flower well together, come to maturity about the same time and the clover is supported from falling by the uncommon strength of the Orchard grass."

W. F. Tallant, Montgomery Co., Virginia, in *Country Gentleman*, says of it, "There is no grass that can be compared with it. This year, 1874, we have experienced the most severe drought known for years, and the hay crop, even on our moist blue grass bottoms, have, in many instances, been an entire failure. Fortunately for me a large part of my farm is Orchard grass, and I have now an abundance of hay from it. Much of our Timothy did not head out at all. Our clover was hardly worth cutting, and our blue grass did but little good until after the late rains; while all the Orchard grass that I saw seemed to be little affected by drought.

I prefer Orchard grass hay to timothy hay as it has more blades, timothy dies out in the course of a few years, while an Orchard grass sod will continue to get better each year for many years. One acre of Orchard grass will afford as much pasture as two of clover and timothy. I believe timothy to be an impoverisher of the land, while Orchard grass forms such an immense sod that for plowing under it is equal to a clover one. Ira Porter, of Chautauqua Co., N. Y., in *Country Gentleman*, of April, 1875, says, "With me Orchard grass has been a success. As a pasture grass it is much better than timothy; with clover it is the most satisfactory crop for hay that I ever tried. The yield is far more than any yield of timothy that I was ever able to obtain from the same land. My soil is a gravelly loam, no water standing within 10 or 12 feet of the surface. Timothy has never succeeded well upon this soil, unless the months of May or June were wet. The quality of the Orchard grass appears to be first-rate, and it is well liked by stock of all kinds. It does not run to

seed the second time, but makes a fine growth of grass. It does not come to its best yield until the third year from sowing."

Mr. William Crozier, of Beacon Stock Farm, Northport, L. I., who has had a large experience in the cultivation of Orchard grass, states that he considers it the most profitable grass a farmer can raise, whether for meadow or pasturage. A ride over his fields during the early part of this month (June) convinced me of its superior merits. While the timothy meadows in many parts of Long Island were so backward as scarcely to appear more than six inches high on an average, I found his Orchard grass and mammoth clover meadows averaging fully two feet, and in flower. Abundance of this rich, succulent herbage was being cut and fed to his horses, &c. His elevated and rolling pasture lands, studded with Alderneys, Ayrshires and Devons, amply supplied with a sweet herbage, composed of a mixture of grasses in which Orchard grass predominates, and with which those pastures are luxuriantly covered. A twenty acre field of oats seeded down with Orchard grass and mammoth clover, 23d of April, was making a fine appearance, the Orchard grass being then several inches high, and coming up very evenly all over the field. There is no doubt but that his success is, in a great measure, owing to the excellent system he adopts. He recommends thorough pulverization and cleansing of the land, liberal manuring, and liberal seeding, even sowing on a rolled surface and covering with a chain harrow afterwards. He has succeeded well with both spring and fall sowing of seeds under the above conditions; he sows from one and a half to two bushels of Orchard grass

seed and fifteen pounds of mammoth clover seed per arce, with his spring or winter grain; nearly double that quantity if sown alone. A bushel of good fair Orchard grass seed should weigh 15 pounds to the bushel, cut during the season that intervenes between the flowering and forming of seed.

CHAPTER III.

PERRENNIAL RYE GRASS.

Lolium Perrenne—Specific Character.

Roots, perrennial; glume, shorter than the spikelet; flowers, 8 to 10; awnless or sometimes short awned. Flowers in June and ripens seeds in July.

WAY'S ANALYSIS.

Of 100 parts as taken green from the field, June 8th.

Water	71.43
Albuminous or flesh forming principles	3.37
Fatty matter	.91
Heat producing principles, starch, gum, sugar, &c.	12.08
Woody fibre	10 06
Mineral matter or ash	2.15
	100.00

In 100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	11.85
Fatty matters	3.17
Heat producing principles, starch, gum, sugar, &c.	42.24
Woody fibre	35.20
Mineral matter or ash	7.54
	100.00

Perrennial Rye Grass (*Lolium Perrenne*) contains upwards of sixty varieties some of which are annual.

It is mentioned in "Worlidge's Husbandry," 1677, as being cultivated at that early period, since which time there have been numerous improvements on the common sort, of which those best known are Russell's, Pacey's, Whitworth's, Stickney's and Ruck's, which are all considered perrennial.

It is found to flourish on most kinds of soil, and grows under circumstances of different management on many upland situations, though sound and somewhat moist midlands are the most appropriate. It soon arrives at perfection and produces in its first year of growth a good supply of early herbage which is much liked by cattle. It produces an abundance of seed which is easily collected. Perhaps there is no other grass so widely known, and in years past, so extensively cultivated as Rye grass has been, throughout the United Kingdom. At present it is supplanted to a great extent by the cultivation of timothy, which seems as in this country to have become an universal favorite. Like timothy, the Rye grass is an impoverisher of the soil, and requires annual top dressing, else in a few years the land becomes exhausted and the grass dies out. The anylsis of this grass will favorably compare with the best of the cultivated grasses, and should be a strong recommendation in favor of its cultivation on a more extended scale than has yet been given it in America. It is superior to timothy, as a mixture for permanent meadow or pasturage.

Perrennial Rye grass was cultivated by Robt. Barnard, at Normanstone, near Georgetown, D. C., in the year 1823, and succeeded very well. "Ruck's" Perrennial Rye Grass, as it was called, was imported and grown by agriculturists in the neighborhood of

Baltimore, in 1824, and succeeding years; it was then in high repute both sides of the Atlantic.

Mr. Crozier, of Beacon Farm, L. I., has grown this grass successfully, but gives the Italian rye grass the preference. All the rye grasses should be cut for hay shortly after they blossom, else their nutritive properties will be greatly diminished. The seed of the Rye grass weighs from 18 to 30 pounds per bushel, and for a separate seeding from 25 to 30 pounds per acre will be required, less if sown with either spring or winter grain. White clover is best to sow with it at the rate of 3 to 4 pounds per acre.

CHAPTER IV.

ITALIAN RYE GRASS.

Lolium Italicum—Specific Character.

Observations. The marked distinction between Italian Rye Grass and the perrennial rye grass and its varieties is that the Italian Rye Grass has an awn or beard adhering to the seed while the varieties of the perrennial are beardless. It flowers in June and ripens seeds in July.

WAY'S ANALYSIS.

100 parts as taken green from the field, June 13th.

Water	75.61
Albuminous or flesh forming principles	2.45
Fatty matters	.80
Heat producing pinciples, starch, sugar, gum, etc	14.11
Woody fibre	4.82
Mineral matter or ash	2.21
	100.00

In 100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	10.10
Fatter matters	3.27
Heat producing principles, starch, sugar, gum, etc	57.82
Woody fibre	19 76
Mineral matter or ash	9.05
	100.00

Compared with any of the varieties of common rye grass, the Italian Rye Grass affords a stronger braird, arrives at maturity sooner, has a greater abundance of foliage, which is broader and of a lighter or more lively green color, grows considerably taller, is more upright or less inclined to spread on the ground, its spikes as already stated are longer, spikelets more thinly set, and upon the whole producing a less bulk of seed which is smaller. In France this grass is stated to be generally sown in the autumn at the rate of 16 to 18 pounds per acre, and the seed rolled in; that in the next autumn the turf is covered like an old meadow, and the crops of the following year is more than double; its growth, also, is so rapid, that if sown with clover or lucerne, it will quickly choke them. It is also said to be of such a hardy nature that when cut in November, it has put forth fresh shoots of a foot in length in the close of December, and it has been found to stand the winter in the North of Europe. In quickness of growth this grass has excelled all others of the true grasses which I have sown this spring and, bids fair to be a good crop notwithstanding the severe droughts it has been subjected to. Italian Rye grass is preferable to any of the other varieties for soiling purposes, it gives an early, quick and successive growth till late in the fall, it will stand any

amount of forcing by irrigation, liquid manures or phosphatic applications, a system which has always been practised in the vicinity of the cities and towns of the United Kingdom, and which has always been considered a paying one.

In one of the large fields of the Beacon Stock Farm which was seeded down last fall with a mixture of orchard grass, timothy, Rhode Island bent, Kentucky blue grass, red top and Italian Rye grass, there is about two acres which was sown exclusively with Italian Rye grass, and its superior appearance is quite noticeable.

CHAPTER V.

ANNUAL RYE GRASS.

Lolium Annum.

WAY'S ANALYSIS.

100 parts as taken green from the field, June 8th.

Water	69.00
Albuminous or flesh forming principles	2.96
Fatty matter	.69
Heat producing principles, starch, sugar, gum, etc.	12.89
Woody fibre	12.47
Mineral matter or ash	1 99
	100.00

Owing to the acquired annual habits of the sort generally known by this name, it differs from the more perrennial varieties by having fewer roots, leaves, and a greater quantity of culms and stalks which are rather longer and furnished with a smaller

proportion of foilage than most of the perrennial varieties. From the quantity and length of its stalks and culms, this sort has been considered as yielding a greater bulk of crop the first season and so better suited for single crops of hay than the perrennial sorts, but the result of experiments tend to show that the quantity of root and stalk leaves which these last produce fully compensatetes for any deficiency which may arise from the weight of their culms, besides rendering the hay less wiry and more palatable than that of the Annual Rye Grass.

CHAPTER VI.

MEADOW FOX-TAIL.

Alopecurus Pratensis—Specific Character.

Culm, upright, smooth, 2 to 3 feet high; palet equaling the acute glumes; awn protruding more than half its length, twisted; the upper leaf much shorter than its inflated sheath. The spike not so long as that of timothy which it very much resembles, the spike of Meadow Fox Tail is soft, while that of timothy is rough. It flowers in May and ripens seeds in July.

WAY'S ANALYSIS.

100 parts as taken green from the field, June 1st.

Water	80.20
Albuminous or flesh forming principles	2.44
Fatty matters	.52
Heat producing principles, starch, sugar, gum, etc	8.59
Woody fibre	6.70
Mineral matter or ash	1.55
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	12 32
Fatty matter	2 92
Heat producing principles, starch, sugar, gum, etc.	43.12
Woody fibre	33.83
Mineral matter or ash	7.81
	100.00

This well known English grass is one of the earliest and most valuable grasses produced in England. It vegetates with extraordinary luxuriance and is therefore both as a first crop and as after grass justly considered as holding the first place among the best grass whether used as green fodder or made into hay; cattle are fond of it, though it is said to be less relished by oxen than by any other stock. It requires two or three years to arrive at maturity. It has been found more hardy against frosts than many other grasses, a property which recommends it for cultivation in this country. It sends forth its spikes almost as soon, and in some situations quite as early, as the sweet scented vernal and is consequently equally valuable as an early grass, and as it is much longer and quicker in its growth, it is of course much more productive. It shoots very rapidly after mowing, producing a very plentiful aftermath, but on account of its not attaining its full productive powers under three years growth it is inferior to orchard grass for the purposes of alternate croppings and to many other grasses besides. Yet for permanent pasturage or meadow on medium or fertile soils it should never form a less proportion than one eigth of any mixture of different grasses prepared for that purpose. Its merits demands this whether with respect to early growth produce, nutritive qualities or

permanency. This grass is making fair progress with me this season, notwithstanding the dry weather experienced during the months of May and June. The seed of Meadow Fox Tail is covered with the soft and woolly husks of the flower while the large glume is furnished with an awn, these peculiarities account for the small weight of a bushel of its seeds. A bushel of seed only weighs 5 pounds. About 2 pounds of seed is sufficient to enter into a mixture with other grass for permanent meadow or pasture.

CHAPTER VII.

TALL OAT GRASS.

Arrhenatherum Avenaceum—Specific Character.

Spikelets, open panicled; two flowered, lower flower staminate, bearing a long bent awn below the middle of the back; leaves, flat, acute, roughish on both sides, most on the inner; panicle leaning slightly on one side; glumes, very unequal; stems, from two to three feet high; root, perrennial, fibrous, sometimes bulbous. Observations. This grass is the *avena elatior of Linneus.* Flowers from May to July.

WAY'S ANALYSIS.

100 parts as taken green from the field July 17th.

Water	72.65
Albuminous or flesh forming principles	3.54
Fatty matter	.87
Heat producing principles, starch, sugar, gum, etc	11.21
Woody fibre	9.37
Mineral matter or ash	2.36
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	12.95
Fatty matter	3.19
Heat producing principles, starch, sugar,gum, etc.	38.03
Woody fibre	34.24
Mineral matter or ash	11.59
	100.00

Tall Oat Grass, though a coarse plant, yet vegetates with great luxuriance; it is early and productive, and affords a plentiful aftermath. It approaches the meadow fox tail in excellence, for which it may prove a substitute in many cases. It is sometimes found abundant in meadows in England. And on the continent of Europe it is cultivated with advantage. It is found most beneficial when retained in a close state of feeding. It makes good hay, is natural to sandy loams but thrives best on strong, tenacious clays in England. Tall Oat Grass was introduced into this country about the begining of the present century. Judge Buel, of Albany, speaking of it in 1823, says: "It possesses the advantage of early, quick and late growth, for which the cock's foot is esteemed, tillers well and is admirably calculated for a pasture grass. I measured some on the 20th of June, when in blossom, (when it should be cut for hay) and found it four and a half feet long. I have sown it in autumn and spring, with clover, on a sandy loam, with good effect."

W. F. Tallant, Christiansburgh, Virginia, writing to me, 15th of February, 1875, says of it: "Tall Oat Grass (or as it is called here in Virginia, Peruvian grass,) is a very valuable variety of grass, and in one or two points has the advantage over orchard grass, which it resembles in its time of maturity,

quickness of growth and its earliness and lateness. I have sown the Oat grass on wheat in the fall, made a good crop of wheat, and late in the fall have mown a fair crop of hay from the same land. Orchard grass always takes two years to make a full crop, while Oat grass sown in the fall on good land will make a crop of hay the next summer. It has also the advantage over orchard grass in seeding. It may be sown either in the spring or fall, while orchard grass in this climate must always be sown in the spring."

I think the fall is the best time to sow the Oat grass but it can be sown either in the spring or fall, with almost a certainty of getting a set, as it very rarely fails. Notwithstanding these two advantages over the orchard grass, it is not as valuable a grass, it never forms as thick and compact a sod as orchard grass. It is more liable to injury from drought. It must never be left one day after it blooms, if you want first class hay, and a rain will injure the looks of Oat grass three times as much as it will injure orchard grass or timothy. If, however, it is cut and handled right, it makes beautiful hay. If cut early and the summer is not an excessively dry one it will head twice in the same summer. I consider the Oat grass a more valuable grass than timothy, as it is not nearly as exhaustive to the soil and if properly handled will make as good hay and twice as much of it.

In reply to enquiries Mr. T. B. Baker, Thorndale, Chester Co., Pa., writes me, March, 1875: "In the spring of 1863, on two acres of good ground I sowed four bushels of Oat grass seed and mixed with usual quantity of barley and both drilled with the ordinary

grain drill. In the fall the grass obtained a growth of 18 inches, the blades very numerous and fine. In the spring of 1864, and every year up to 1871, I have cropped it for seed and mowed the stubble for hay. The stubble makes superior hay, because of the numerous green blades about a foot long growing from the roots of the grass while the seed is ripening. I have now about 100 acres of land seeded with this grass and orchard grass mixed. The grass matures for hay about the 5th of June and for seed about the 10th to 15th. The seed is very difficult to save, the moment almost that it is ripe it falls off; the top seeds ripens a few days earlier than the lower seeds. For two seasons, I lost all the seed by delaying cutting a few days. There is no difficulty about getting three crops a year for soiling cows. By the middle of May the grass will be from ten to fifteen inches high. In the beginning of July it will be fit to cut again, and a third time in the latter part of August. For pasture it excells all the grasses with which I am acquainted. Cattle, horses and sheep prefer it to any other grass I have on the farm.

I have heretofore seeded it with wheat in the fall; the only objection to this is that the grass grows as fast as the wheat and is quite as tall at the harvest as the grain. The straw however is better than most of the hay that is made. The quantity of seed to the acre should not be less than two bushels. I prefer three. The grass ripens for hay rather earlier than than clover, and is therefore better to sow with clover than timothy."

A bushel of Tall Oat grass seed weighs seven pounds.

CHAPTER VIII.

SMOOTH STALKED POA OR MEADOW GRASS, JUNE GRASS, KENTUCKY BLUE GRASS, COMMON SPEAR GRASS.

Poa Pratensis—Specific Character.

Culms sending off copious running root stocks from the base, and the sheaths smooth; ligule short and blunt; panicle short pyramidal; spikelets 3 to 5 flowered; crowded, and most of them almost sessile on the branches, ovate lanceolate or ovate; lower palet 5 nerved, hairy along the margins as well as the keel. Observations: This grass is distinguished from the Poa Trivalis rough stalked meadow grass by its strong creeping roots, sheaths of the straw being smooth; whereas in the Poa Trivalis the sheaths are rough to the touch, the sheath scale is blunt, in the Poa Trivalis it is pointed, the leaves are blunt, those of the Poa Trivalis are acuminate. Flowers in June and ripens seeds in July.

WAY'S ANALYSIS.

100 parts as taken green from the field June 11th.

Water	67.14
Albuminous or flesh forming principles	3.41
Fatty matters	.86
Heat producing principles, starch, gum, sugar, etc	14.15
Woody fibre	12.49
Mineral matter or ash	1.95
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	10.35
Fatty matter	2.63
Heat producing principles, starch, sugar, gum, etc	43.06

Woody fibre	38.02
Mineral matter or ash	5.94
	100.00

This grass has always been a favorite one in England as a mixture with other grasses for permanent pasture, meadows and lawns; but as a separate crop it is rarely or ever cultivated.

Mr. Curtis, in his valuable *Flora Londonensis*, says of it: "The Smooth Stalked Poa is a sweet grass, and readily eaten by cattle in general, it carries its verdure in the winter better than most others, and in the following spring throws out numerous young shoots, so as to make excellent spring food. It produces a good crop of leaves at the bottom, which makes exceedingly fine hay and is fit for cutting early in the spring."

Another writer says: "This is one of the most useful grasses, for it vegetates in the driest soils, supports its verdue during the winter and in the spring throws out numerous shoots for early pasture, the the hay is also of fine quality."

George Sinclair, in his *Hortus Gramineus*, says: "This species sends forth flowering stems, but once in the season, and these being the most valuable part of the plant for the purposes of hay, and considering the superior value of the aftermarth, over that of the seed crop it will appear from these properties to be well adapted for permanent pasture. It is however the property of all creeping roots to scourge the soil and when plants with fibrous roots can be substituted in the place of those with an equal prospect of advantage in regard to early growth produce and nutritive qualities it will be found to repay the labor with interest."

Although Poa Pratensis is kown all over Northern Europe as far as St. Petersburgh 60 degrees north latitude, yet in no part of Europe has the merits of the Poa family been so fully developed as in the states of Virginia, Maryland and the far famed Kentucky Blue grass region, which lies across the middle of that state and covers about twenty counties including on area of 15,000 square miles. This region also extends over several counties in Ohio, but the grass does not seem to flourish so luxuriantly on the Ohio side, although in other counties of Ohio it is said to grow as luxuriantly and form as staple a pasture grass as it does in any part of Kentucky. The cultivation of this grass must have improved wonderfully within the last fifty years. In an address delivered by Col. Emory to the Agricultural Society of Queen Anne Co., Maryland, in 1822, and afterwards published. Referring to the neglect of cultivating the natural grasses, he remarked: "Indeed, so far are we from promoting the vigorous efforts of the invaluable grasses of the Poa class, which by nature as if out of patience seems in her bounty determined to force upon us that we are in the habit of denouncing them (next to the Hessian fly) as our deadliest enemies, and of excercising our best but misapplied skill to extirpate them forever. If our neglected flocks of cattle and still more neglected sheep, could be endowed with the power of speech, how eloquently would they defend those friends which give them power enough almost unaided to weather the winter storm, and which came to their aid in the spring just time enough to keep life and carcass, together. I allude to the grasses commonly called the Blue grass and the green grass. They are

highly valuable to all farmers, except those who are fond of a naked fellow. This appeal in favor of the cultivation of the Blue and green grasses shows the difference of opinion that existed of their merits and demerits at that time."

W. S. Rand, of Lewis Co., Kentucky, who has had a large experience in the cultivation of Poa Pratensis, says of it: "Common Spear grass and Kentucky Blue grass is one and the same, varying in size and appearance according to the soil and latitude in which it grows. The plant is a light green color, the spikelets frequently variegated with bluish purple. Flowers in June, but once a year, which recommends this for lawns. The produce ordinarily is small compared with other grasses, but the herbage is fine. It grows in a variety of soils, from the dryest knolls to a wet meadow. It does not stand severe drouths as well as the orchard grass. It endures the frosts of winter better than all other grasses, and continues luxuriant through mild winters. It requires from two to three years to become well set, does not arrive at perfection as a pasture grass till the sward is older than three years, hence it is not suited to alternate husbandry, or where the land is to remain in grass only a few years and then to be plowed up. The best Blue grass is found in shaded pastures. It is the first plant that puts forth its leaves and remains green if the season is favorable. Early in the fall it takes a second growth and flourishes vigourously until the ground freezes. Blue grass makes the sweetest and best of hay. It should be cut as the seeds begins to ripen, spread well and protect from rain and dews, on the second day. stock and shelter and salt. Blue grass

is not commended to cultivate especially for hay. It is not as profitable a product to merchandize as timothy and orchard grass. Blue grass on limestone land is perpetual, if properly managed, and the perfection it attains in Kentucky is to be attributed to favorable soils, a temperate climate and mild winters, all of which have contributed to make Kentucky Blue grass the basis of our agricultural wealth and prosperity."

In the states of Pensylvania and Delaware, also in other places, there is great confusion casued by calling other grasses of the Poa family by the name of Blue grass. The editors of the *Country Gentleman* took great pains a few years ago to set this matter right. They state: "We have, ourselves, in Kentucky, Ohio, Pensylvania and other states, given particular attention to the subject, consulting with those best qualified to speak authoritively. Poa Pratensis is unquestionably the grass known in Kentucky as "Blue grass," and in other states by the name of Kentucky Blue grass. In Pennsylvania and Deleware, however, this same grass is popularly called "green grass," while the variety botanically termed Poa Compressa, does have priority of claim to designation as Blue grass, but there is no doubt that what is known as Kentucky Blue grass, the grass which gives their peculiar value to the grazing lands of Fayette, Woodfurd, Bourbon and adjoining counties in Kentucky, is something quite different and is in fact Poa Pratensis. In Eastern Pennsylvania and Delaware the farmers will say that green grass produces the herbage which renders their best pastures of almost unrivalled excellence, and will point out as Blue grass specimens of Poa Compassa,

which may also be found quite generally, wondering not a little as they do so that in Kentucky, Blue grass is so highly esteemed. Let it be remembered then whatever may be the botanical name of Blue grass in other states, Kentucky Blue grass is Poa Pratensis and nothing else. It will do no harm, moreover, to recollect that the green grass that grows on the banks of the Brandywine, is also Poa Pratensis, and that the Blue grass of the latter and other eastern localities is not Kentucky Blue grass, but is Poa Compressa."

The seeds of Poa Pratensis are very small and securely covered with husks, but when rubbed hard between the palms of the hands, appear of a long oval shape, wax color and hard. From 3 to 4 pounds enter into a mixture with other seeds for permanent meadow or pasture, 20 pounds to two bushels, if sown alone. The seeds of this grass weigh 13 pounds per bushel.

CHAPTER IX.

FLAT STALKED OR CREEPING POA.

Poa Compressa—Specific Character.

Panicle flowering on one side, rather dense, spikelets oval oblong, 6 to 7 flowering; flowers connected at the base by a complicated web of hairs; culm compressed; root creeping. Observation: culms from a foot to a foot and a half high, compressed decumbent at the base, oblique afterwards, and erect towards the top, striated smooth, sometimes sending forth culms at the joints; leaves short linear, acute

flat, somewhat glaucous, bluntish condensed; florets from three to nine, according to the age and strength of the plant; closely imbricated, oval angular, these three nerved purple below the tips which is silvery and scariose at the base, connected by very fine complicated short villous hairs. Flowers in July and ripens seeds in August.

In England this grass flowers during the greater part of the summer, and is considered one of the most valuable of the tribe, for its dark green leaves grow so firmly together as to form a short turf of the richest pasture which is supposed to contribute much to the delicate flavor of the flesh of sheep and deer, to which animals it is peculiarly grateful. Its bluish green stems retain their color after the seed is ripe. It shrinks very little in drying, thus making a hay very heavy in proportion to its bulk. It will be seen in the latter part of the preceeding chapter on Poa Pratensis, that this grass is extensively cultivated in the states of Pennsylvania and Deleware, to which states it is principally confined, as I cannot learn of its cultivation to any extent in the Northern or Eastern states.

CHAPTER X.

ROUGH STALKED POA, OR ROUGH STALKED MEADOW GRASS.

Poa Trivialis—Specific Character.

Webbed florets; outer palea five ribbed; marginal ribs not hairy; ligule long and pointed; stems two to three feet high; distinguished from June grass by

having rough sheaths, while in the latter the sheaths are smooth, the ligule obtuse and the marginal ribs of the outer palea furnished with hairs, it differs from June grass also in several other respects. The Rough Stalked Meadow grass has a fibrous root, that of the June grass is creeping. Flowers in June and ripens seeds in July.

WAY'S ANALYSIS.

100 parts as taken green from the field June 18th.

Water	73.60
Albuminons or flesh forming principles	2.58
Fatty matters	.97
Heat producing principles, starch, sugars, gum, etc.	10.54
Woody fibre	10.11
Mineral matter or ash	2.20
	100.00

100 parts of the gaass dried at 212° Fahr.

Albuminous or flesh forming principles	9.80
Fatty matters	3.67
Heat producing principles, starch, sugar, gum, etc	40.17
Woody fibre	38.03
Mineral matter or ash	8.33
	100.00

This grass has got quite an European reputation. In Lombardy it is accounted the queen of meadow plants. In England it is considered an excellent grass on good moist loams, and much relished by cattle of all sorts. Though this grass has much similarity in appearance to poa pratensis, especially in the mode of flowering, it differs essentially in its qualities, the latter principally occurs in moist meadows and the former is chiefly found in dry pastures. It delights in moisture and sheltered situations, on which account, though there are few more productive or better adapted for the purpose of pasturage or hay,

it is tender and liable to be injured by severe cold or drought, and in moist, rich ground it has been observed to grow tall, while it has been found equally diminutive in poor land. It however yields abundant herbage, and in places suited to it, it grows to such a prodigious length that it is said to have been found on the famous Orcheston meadow, near Salsbury Plain, fully eight feet long. This grass should only be sown on moist, fertile and sheltered soils, and about 3 pounds of its seed should enter into a mixture of other grasses for that purpose. 15 pounds of Poa Trivalis seed make a standard bushel.

I have sown it this spring, separately and with other grasses.

CHAPTER XI.

FOWL MEADOW.—FALSE RED TOP.

Poa Serotina—Specific Character.

Culms tufted without running rootstocks; leaves narrowly linear, soft and smooth; ligules elongated, spikelets 2 to 4 (rarely 5) flowered (1-12 to 1-6 inch long), all short, pedicilled in an elongated panicle, often tinged with dull purple; flowers and glumes narrow; lower palet very obscurely nerved.

Flowers in July and August.

This grass has been known and cultivated in the New England states from an early period.

Jared Elliot, writing in 1749, mentions it as growing tall and thick, making a more soft and pliable

hay and better adapted for pressing and shipping off for the use of horses on board, than Herd's grass (Timothy). It yields well to the acre, and will not spoil, although it stands beyond the common time of mowing. It must be sowed in low moist land. The cultivation of this grass seems to be principally confined to the New England states, where it is considered a valuable grass. Its merits consist in its thick and abundant growth on land more moist than is well adapted to common upland grasses. It never grows so coarse or hard but that the stalk is sweet and tender, and eaten without waste.

It should enter largely into a mixture with other grasses sown on good, moist soils. I have sown it this spring.

CHAPTER XII.

CRESTED DOGS' TAIL.

Cynosurus Cristatus—Specific Character.

Its spikes are simple, linear; spikelets awnless; stems one foot high, stiff, smooth; root perrennial, fibrous and tufted. Flowers beginning of July and ripens seeds end of July.

WAY'S ANALYSIS.

100 parts as taken green from the field June 21st.

Water	62.73
Albuminous, or flesh forming principles	4.13
Fatty matters	1.32
Heat producing principles, starch, gum, sugar, etc	19.64
Woody Fibre	9.80

Mineral matter or ash	2.38
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	11.08
Fatty matters	3.54
Heat producing principles, starch, gum, sugar, etc.	52.64
Woody Fibre	26 36
Mineral matter or ash	6.38
	100.00

This grass grows upon sandy and calcareous soils, and is therefore well calculated for dry upland pastures, where it forms a thick, short turf and affords wholesome food for sheep. It will not thrive in very moist meadows, but grows best in dry situations. In some parts of Woburn Park this grass forms the principal part of the herbage. It also abounds in the famous pasturages of Pampton, in Devonshire. It is also the prevailing grass in the best grass meadows of the vale of Pickering.

From its forming a close turf, and having rather fine foilage, it may be advantageously sown on lawns and other places to be kept down with the scythe, it not being so difficult to cut as its hardish like culms and leaves would lead one to suppose. At least 10 or 11 lbs. should enter into a mixture with other suitable grasses intended for lawns, which are to be cut frequently. The weight of a bushel is 26 lbs.

This grass has been introduced into this country and the seed may be had at the principal seed stores in New York city.

I have sown it both as a mixture with other grasses and separately, for experiment, this spring.

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summer and to retain its verdure during winter in a remarkable degree. It constitutes a great portion of the most natural pastures in Scotland, especially when the soil is light and dry. From the pureness of its foilage and greenness in winter it is well adapted for sowing in parks and pleasure grounds, especially for sheep pasture, but for short grass to be kept down with the scythe it should, from its wiry nature, enter sparingly into the mixture. About 2 lbs. with a mixture of other seeds. A bushel of the seeds of Festuca Duriuscula weigh 10 lbs. I have sown it this season.

CHAPTER XV.

MEADOW FESCUE.

Festuca Pratensis—Specific Character.

Its panicle is nearly erect, branched, close, somewhat inclined to one side; spikelets linear, with from nine to ten cylindrical flowers, leaves linear, of a glossy green, pointed, striated, rough on the edges; stems round, smooth, from two to three feet high, roots creeping, perrennial. Its radical or root leaves are broader than those of the stem, while in most other species of fescue the radical leaf is generally narrower than those of the stem. Flowers in June, seeds ripe in July.

Col. St. Leger is supposed to be the first who entered largely into the culture of this grass in England. It comes near in its appearance to rye grass, but seems greatly superior, at least for the purpose

of forming or improving meadows, as being larger and more productive in foilage. It is hardy, strictly perrennial, and thrives well, not only in wet, but in dry grounds, growing in all situations. It abounds in the best meadows in the best hay districts, and in short, seems well calculated to supply the defects of rye grass. It has also the quality of producing more seeds than most of the other sorts of grasses which grow rapidly and are easily gathered. No plant, whatever, deserves more the attention of the farmer than this, it being of certain growth, easy culture, productive and remarkably sweet. It will thrive in either dry or wet soils, an advantage which most others do not possess ; and, except in point of early growth, it appears to be little inferior to Fox Tail. This grass, which is seldom absent from rich meadows and pastures, is observed to be highly grateful to oxen, sheep and horses, particularly the former. It appears to grow most luxuriantly with the hard fescue. This is said to be the Randall grass of Virginia. About 2 lbs. of seed as a proportion in a mixture with other seeds. A bushel of this seed weighs 14 lbs. I have sown this grass in a mixture, also seperately, for experiment.

CHAPTER XVI.

TALLER, OR MEADOW FESCUE.

Festuca Elatior—Specific Character

Panicle narrow, contracted before and after flowering, erect, with short branches ; spikelets crowded,

5 to 10 flowered, the flowers rather remote, oblong lanceolate; lower palet 5 nerved, scarious margined, blunt, acute, or rarely with a distinct but very short awn. The type is large, 3 to 4 feet high; spikelets about half an inch long, in an ample and compound panicle; root perrennial, fibrous, somewhat creeping and forming large tufts. Flowers in June and ripens seeds in July.

This species may be easily distinguished from Festuca Pratensis by being much larger (nearly double) in all its parts, it is also like it perrennial and fibrous rooted, grows naturally on moist, superior soils in waste places, by the banks of rivers, etc. It is rather a coarse like grass, but may be sown either for hay or permanent pasture on moist soils, shady places, etc. It yields an abundant crop, and notwithstanding its seeming coarseness, is relished by cattle generally. It stands highest, according to the Woburn experiments, of any of the Fescues as to the quantity of nutritive matter afforded by the whole crop when cut at the time of flowering. It is a very valuable grass to sow on wet or moist lands, from its rapid growth it is calculated to smother or keep down the coarser kinds which naturally abound in these situations. For a separate seeding from 20 to 28 lbs. per acre; for a mixture with other grasses, judgment must be exercised in all mixtures of grasses, whatever grass is required to prodominate must be sown in excess of the others. A bushel contains 14 lbs.

CHAPTER XVII.

SWEET SCENTED VERNAL.

Anthoxanthum Odoratum—*Specific Character.*

Spikelets (brownish or tinged with green), spreading at flowering time; one of the neutral flowers, bearing a bent awn from near its base, the other short awned below the tip. Perrennial. Flowers in May and ripens in June.

WAY'S ANALYSIS

100 parts as taken green from the field May 26th.

Water	80.35
Albuminous or flesh forming principles	2.05
Fatty matters	.67
Heat producing principles, starch, sugar, gum, etc	8.54
Woody fibre	7.15
Mineral matter or Ash	1.24
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	10.43
Fatty matters	3.41
Heat producing principles, starch, sugar, gum, etc	43.48
Woody fibre	36.36
Mineral matter or Ash	6.32
	100.00

This is one of the earliest of the English grasses, and grows on almost any kind of soil. Although neither very productive nor nutritive, and far from being a favorite to cattle when given them alone. It yet possesses the peculiar value of being the only fragrant plant natural to English fields, and imparts the delightful perfume so perceptible in new hay. It indeed forms a part of the herbage on all good

meadow land, and although its chief utility seems to consist in giving flavor to the new dried fodder, yet when thus mixed it is grateful to all stock, and therefore should always be sown with the other seeds of permanent grasses. This grass has been extensively naturalized in this country, and is common in pastures and roadsides. In respect to early growth, continuing to throw up flowering stalks till the end of Autumn, and its hardy and permanent nature sufficiently upholds its claim to a place in the composition of all permanent pastures. The superior qualities of its aftermath are a great recommendation for the purpose of grazing. Its analysis is a good one. 2 lbs. of seed is sufficient to enter a mixture with other grasses. Its seeds weigh only 6 lbs. per bushel. I am growing this grass.

CHAPTER XVIII.

YELLOW OAT GRASS.

Avena Flavescens—Generic Character.

Spikelets three to many flowered, with an open, large, diffuse panicle; lower pale, seven to eleven nerved, with a long, twisted awn on the back; stamens three; grain oblong, grooved on the side, usually hairy and free. Flowers in July, and ripens seeds in August.

WAY'S ANALYSIS.

100 parts as taken green from the field June 29th.

Water	60.40
Albuminous or flesh forming principles	2.96
Fatty matters	1.04

Heat producing principles, starch, gum, sugar, etc	18.66
Woody fibre	14.22
Mineral matter, or Ash	2.72
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	7.48
Fatty matters	2.61
Heat producing principles, starch, sugar, gum, etc	47.08
Woody fibre	35.95
Mineral matter, or Ash	6.88
	100.00

Yellow Oat grass, grows naturally in dry pasture on rather light and good soils yields a considerable bulk of fine herbage, and deserves to form a portion of all mixtures on light, dry soils, either for hay or pasture. It arrives early at maturity, and although a perrennial, yet if allowed to ripen seed, it is is but of short duration, particularly if grown on stiff, moist soils. It is the most useful, as a hay and pasture grass, of the genus Avena, as well as the smallest seeded of all the native species.

Mr. Tauton says of it: "That it is so rich in its qualities, and so universal a citizen of the world, that there is no soil from the lightest calcareous loam, to the stiffest clay into which he would not introduce it where he intended to form a permanent turf." It is said that a top-dressing of lime will double the produce of this grass, and that it thrives best on calcarious soils. About 1 or two lbs. of seed should enter into lawn mixtures. 5 1-2 lbs. make a bushel of the seeds of Avena Flavescens.

CHAPTER XIX.

DOWNY OAT GRASS.

Trisetum Pubescens—Generic Character.

Spikelets 2; several flowered, often in a contracted panicle; the lower palet compressed keeled, of about the same membranaceous texture as the glumes, bearing a bent or flexuous (rarely twisted) awn below the sharply two-toothed or two-pointed apex (whence the name from tris, three, and seta, a bristle): otherwise nearly as in Avena. Gray. Flowers in June, and ripens seeds in July.

WAY'S ANALYSIS

100 parts taken green from the field July 11th.

Water	61.50
Albuminous, or flesh forming principles	3.07
Fatty matters	.92
Heat producing principles, starch, sugar, gum, etc	19.16
Woody Fibre	13.34
Mineral matter, or Ash	2.01
	100.00

100 parts of the grass dried at 212° Fahr

Albuminous, or flesh forming principles	7.97
Fatty matters	2.39
Heat producing principles, starch, sugar, gum, etc	49.78
Woody Fibre	34 64
Mineral matter, or Ash	5.22

Downy Oat grass, Trisetum Pubescens, better known as Avena Pubescens, A Vel. Trisetum Pubescens. Is generally found growing on dry, rocky soils, also on chalky ones in England. It is only of late years that it has received much attention. It is now considered a good permanent grass to be sown on medium lands, on account of its hardiness and and its being but a slight impoverisher of the soil. It

will be seen by a comparison of the analysis of Avena Flavescens with that of this grass that one is equally as good as the other. I am not aware of this grass being cultivated to any extent in this country.

CHAPTER XX.

QUAKING GRASS.

Briza Media—Specific Character.

Panicle erect, the branches spreading; spikelets 5 to 9 flowered (3-12 inch long); glumes shorter than the lower flowers; root perrennial. Flowers in June.

WAY'S ANALYSIS.

100 parts as taken green from the field June 29th.

Water	51.85
Albuminous, or flesh forming principles	2.93
Fatty matters	1.45
Heat producing priuciples, starch, sugar, gum, etc	22.60
Woody Fibre	17.00
Mineral matter, or Ash	4.17
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous, or flesh forming principles	6.08
Fatty matters	3.01
Heat producing principles, starch, sugar, gum, etc	46.95
Woody Fibre	35 30
Mineral matter, or Ash	8.66
	100.00

Briza Media (Quaking grasss.) Grows naturally in light inferior or rather dry soils, and from a given weight yielding more nutritious matter than any other grass indigenous to such soils. Owing, however, to the seeds not retaining their vegetating

powers beyond a rather limited period, and the difficulty with which they are procured, its cultivation is attended with considerable disadvantage, for such as suit it best will not afford paying a high price for the seed, and its foilage is not produced in great quantities, owing to its shortness.

There is a variety occasionally to be met with in moors differing from the common in being of a much more light and yellowish green color, but in other respects the same. There is a hardy annual, the Large Quaking grass (Briza Maxima) cultivated in gardens for ornament, which grows about one foot high, very elegant; also the Briza Graciles (slender Quaking grass), grown for ornament. Briza Media is found growing naturally in pastures in the middle and Eastern States.

CHAPTER XXI.

WOOLLY SOFT GRASS; OR, YORKSHIRE WHITE. MEADOW SOFT GRASS. VELVET GRASS.

Holcus Lanatus—Specific Character.

Perrennial, soft, downy and pale; panicle oblong; upper glume mucronate, awned under the apex, awn of the staminate flower curved. Flowers in July, and ripens seeds in July.

WAY'S ANALYSIS.

100 parts as taken green from the field June 29th

Water	69.70
Albuminous, or flesh forming principles	3.49
Fatty matters	1 02
Heat producing principles, starch, sugar, gum, etc	11.92
Woody Fibre	11.94

Mineral matter, or Ash	1.93
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous, or flesh forming principles	11.52
Fatty matters	3.56
Heat producing principles, starch, sugar, gum, etc	39.25
Woody Fibre	11.30
Mineral matter, or Ash	6.37
	100.00

This is a very common grass in England and grows on all soils, from the richest to the poorest. It attains to the greatest degree of luxuriance on light moist soils; particularly on those of a peaty nature. Cattle are not fond of this grass. It is chiefly used on sheep walks and answers well for that purpose. It is said to occasion a violent discharge of urine, and general weakness, if given to horses. There being so many grasses superior to this, in many respects, it cannot support a good claim to a place in the composition of the best permanent pastures and for the cultivation singly or by itself it is wholly inadmissible. It produces a profusion of seed which being light is easily dispersed by the winds and though a late flowering grass the seeds ripens sooner than that of most others and before hay harvest begins, is generally perfected. This grass has long been introduced into this country. It is known by the names of Salem grass and White Timothy in the Eastern States. Its seeds weigh 7 pounds per bushel. I am growing this grass.

CHAPTER XXII.

CREEPING SOFT GRASS.

Holcus Mollis.

This grass is easily distinguished from holcus lana- by its producing fewer culms, having more loose panicles, longer awns (hence it is sometimes termed Bearded soft grass) broader foilage and powerfully creeping roots, grows naturally in a great variety of soils. These two species of Holcus are distinguished from all the rest of our common grasses by the soft and wooly appearance of their panicles, those of Holcus Lanatus assume a great varieiy of shades in color, from a white to a beautiful red, but generally on a whitish like ground. These grasses are chiefly used on sheep walks in England and are said to answer well for that purpose. Flowers in July and ripens seeds in August.

CHAPTER XXIII.

FINE BENT GRASS, RED TOP, FINE TOP, BURDEN GRASS, HERD'S GRASS OF PENNSYLVANIA AND SOUTHERN STATES.

(*Agrostis Vulgaris*)—*Specific Character.*

Rootstocks creeping; culm mostly upright (1 to 2 feet high); panicle oblong with spreading slightly rough short branches, (purple); leaves linear, flat; ligule very short, truncate; lower palet nearly

equalling the glumes, chiefly awnless, 3 nerved ; the upper one half its length. Gray. Flowers in July and ripens seeds in August.

In England and Sister Kingdoms. This grass has always been considered as a troublesome weed in dry, light soils, and not being well liked by cattle, it commonly attracts attention as a useless grass to be got quit of as soon as possible, more particularly as its creeping roots prove highly injurious to the soil. However, notwithstanding its bad qualities, sheep are found to eat it, particularly in the winter months, and it is sometimes sown on bare, gravelly places, where the more valuable grasses will not grow, for the purpose of covering them with vegetation. Red Top has been long and favorably known in this country as a permanent pasture grass. It is supposed by some to have been introduced into the Northern States. But I am inclined to the belief that it is as much indigenous to the soil of America as it is to that of any part of Great Britain. It is found growing naturally on all the fertile and medium soils on Long Island and there are few meadows of three or four years standing in which Red Top is not found in abundance, and is sure to assert its supremacy and become permanent, while in the course of six or seven years the timothy has disappeared. In fact, the pasture lands of Long Island have at least two thirds of Red Top in their composition. A circumstance which proves the neglect and indifference shown toward the cultivation of the more valuable permanent grasses. As a consequence improved breeds of cattle or sheep are rare upon the Island, except on the lands of progressive farmers, whose system of grass culture embrace a mixture of

useful species which afford a sweet and varied herbage so grateful to stock of all kinds.

Red Top as a mixture with other grasses is necessary, but only in small quantities, on land capable of producing better grasses. On soil, where the more valuable grasses will not suceeed as already stated, it is highly useful for the purpose of covering them with vegetation. On pasture lands where Red Top predominates, the fields must be overstocked, for if allowed to grow up to seed, the cattle refuse it, which is sufficient evidence that it is not so much relished by stock as some of the other pasture grasses. This running into extremes in the cultivation of Red Top and the now very popular Rhode Island Bent both of which I consider one and the same grass, any difference in their appearance being produced by varieties of soils, is strikingly exemplified in Central Park, New York, where these grasses predominate, and where in many instances they are trampled over and not eaten, whereas if orchard grass and many other valuable grasses were substited, the latter would be eaten with avidity. Although it is claimed that the Agrostis, or Bent grasses thrive best in moist soils, yet it has been sufficiently proved that Agrostis vulgaris, (the true red top) may be sown to advantage on a variety of soils.

It would answer well to sow Red Top separately on moist lands where old grass has run out, or become mossy. On such places it would fill the soil with its numerous roots and make it more passable. Also on moist, undrained soils, liable to occasionally overflow, if cut early, it has a thick bottom, and makes a heavy crop of second-hand hay.

From 21 to 28 lbs. of seed per acre on such soils should be sown. About 2 or 3 lbs. of the seed of this grass should enter into a mixture with the seeds of other grasses for permanent pasture. 12 lbs. of Red Top seed make a bushel.

CHAPTER XXIV

LARGE LEAVED, CREEPING BENT GRASS OR FIORIN.

Agrostis Stolinifera Var 1 *Latifolia—Specific Character.*

Panicle loose at the time of flowering contracted afterwards; florets large, numerous; calyx husks acuminate, outer serrulated from keel upwards; inner only slightly toward the top.

The peculiar value of the Fiorin and of other grasses of the Agrostis family arise from their fitness for winter pasture as they lose very little of their bulk or nutriment by remaining on the soil after they have ceased to grow. The Fiorin grass to be in perfection requires a moist climate or a wet soil, and it grows on cold clays unfitted for other grasses; in light sand and dry situations its produce is inferior as to quantity and quality. Fiorin or as it is commonly called in the North of Ireland *Faureen*, was first introduced to the notice of the British public some seventy years ago by Rev. Doctor Richardson, of Clonfecle County, Antrim, Ireland. A committee of several members of the Agricultural society of Kirkcudbright Scotland, visited the Doctors' farm about that time for the purpose of examining it They described it as

putting forth a great profusion of strings (lateral) like the side shoots by which strawberries increases and by which it is propagated. The roots penetrate but a short distance into the soil, thus denoting that its chief sustenance is drawn from the atmosphere and it is represented, 1st, to grow luxuriantly in low and swamp grounds which but for the cultivation of it would be of little or no value. 2nd, that it grows in such great quantities in irrigated meadows which are most favorable to it, that it has been known to produce four times the weight of any single crop of any other grass. 3rd, that cattle are so extremely fond or partial to it as to prefer the hay made from it to any other hay whatever, and that from the length of time which it annually vegetates, it may be used as green food during the greater part of the Winter.

The high value of a crop of Fiorin in Scotland (at that time) was evidenced by the fact that the Highland Agicultural Society awarded two premiums of twenty and ten guineas for the greatest product on an acre, in certain Counties.

James Baird, manager of Shotts, Iron works, Scotland, raised it with great success. His product was from five to seven tons per acre. Sir James Stewart cultivated it on a spongy mass, and obtained from five to six tons on an English acre, cut the last of September, put in small stacks and left in the mead ow till wanted.

Dr. Richardson cut on different pieces his eleventh, twelfth, and thirteeth crops without any falling off in quantity.

To this day Fiorin or Faureen, is held in high estimation by the farmers of the north of Ireland. There are hundreds of Irishman in the states who

can bear testimony from observation to its excellent quality as a rich succulent and sweet food for cattle.

That it is not more extensively cultivated in other countries than Ireland, may be attributed to the fact that the specimens of the different varieties of Agrostis stolonifera resemble each other so much that they may be easily mistaken for each other without close inspection and some knowledge of botany to assist it. The first variety being therefore scarce, and the other very common, there is little room for surprise at the contradictory result of experiments that have been made on one or other of these inferior varieties by gentlemen equally eminent for agricultural knowledge, under conviction of their being one and the same grass as recommended by Dr. Richardson under the name of Fiorin, whereas though they agree in the general habit of Dr. Richardson's variety and indeed in every respect, except that Fiorin appears to be confined to rich ancient pasture land, as its natural place of growth, and the other varieties to various soils and situations; their inferiority in every agricultural merit is so great as to justify the opprobious epithets that have been bestowed upon them by those who from the above causes have differed from Dr. Richardson's statement of the merits of the first variety of Fiorin, and prevented justice being done to the discovery which it may have deserved.

Although it may be propagated by the seeds, yet they are of such slow growth, that they are apt to be overpowered by weeds, and the better mode is to plant small cuttings of the grass in the latter end of Autumn.

The land should be drained as well as circumstances may permit; for although it suits a wet soil

and irriagted land, yet the water should not be suffered to rest upon it; the ground should be cleaned and pulverized, and the cuttings scattered over the surface, after which it should be slightly covered with loose earth, or with peat or wood ashes, and earth well mixed. These cuttings are prepared in the simplest manner by twisting the strings into loose rope about the thickness of the arm, and then cutting them with an axe or hedge-bill (bill hook) upon a plank into lengths about three inches and one half. When the crop comes up, it should be carefully weeded two or three times the first year; after which there will be no occasion for a repetition of that process.

For sowing on land in moist situations, Forin is well deserving of cultivation. There is no grass perhaps of which cattle are so fond either in a green or dried state, and on land on which I have seen it grow, it seems to be of a perpetual nature. From 20 to 24 pounds is required per acre.

CHAPTER XXV.

MEADOW SPEAR GRASS, NERVED MANNA GRASS.

(*Glyceria Nervata*)—*Specific Character.*

Branches of the loose panicle capillary, at length drooping, the very numerous small spikelets ovate oblong 3 to 7 flowered; leaves rather long. Moist meadows very common. Flowers in June. Observations. Panicle often half a foot and more in

length. with slender branches pressed close, and subdivided; spikelets small, of a green color. Valves of the blossom smooth, having five raised nerves on each valve; leaves in two rows resembling a fan somewhat rough; Culm, a little compressed. Root, perrennial. Native of America.

Sinclair had a high opinion of the hardy qualities of this grass; he states that in February 1814, after the severe winter preceding, this grass was perfectly green and succulent, while not one species of grass out of nearly 300 different species that grew around it remained in a healthy state, but were inferior and more or less injured by the severity of the weather.

The crops of this grass, he found by experiment at the time of flowering, and at the time the seed was ripe, to be equal in point of quantity and *nutrient* quality a circumstance which did not occur in any other grass in the experiments made at that time. The nutritive matter contained in the latter math, is likewise greater than in most other grasses. The root leaves are produced on a shoot, and stand in two rows after the manner of a fan. This shoot which is formed by the union of the base leaves, is very succulent, and contains a greater proportion of nutritive matter than the leaves which accounts for the superiority of the latter math in nutritive matter. This grass is the Fowl meadow of many farmers in Eastern states while Poa Serotina is called by them, Bastard Fowl meadow.

In Pennsylvania, this grass is very common in wet marshy grounds but it does not appear that any attention is paid to its cultivation. It is useful as a mixture on wet or moist pastures.

CHAPTER XXVI.

FLOATING GLYCERIA, MANNA GRASS.

(Glyceria Fluitans)— Specific Character.

Spikelets 7 to 13 flowered; lower palet, oblong, obtuse, or the scarious tip acutish, entire or obscurely, 3 lobed, usually rather longer than the blunt upper one. Flowers in June and ripens seeds in August. Observation. Leaves long, broad, and floating when in deep water. Root fibrous and creeping, perrennial height two to three feet.

This grass grows naturally in and by the sides of ditches, pools, rivers, and on alluvial fresh water, marshy soils. Generally this grass is eaten with avidity by horses, cattle, sheep and swine.

It has been said not to thrive except constantly in water, but there are few grasses better adapted for irrigated meadows, and even on moderately dry ground it will yield a considerable produce. Its seeds are very nourishing and form the manna seeds or manna croups of the stores which are used in soups and gruels. They are rather difficult to collect from their ripening irregularly and being easily shaken off when ripe. The seeds of this grass weigh 15 pounds per bushel.

CHAPTER XXVII.

REED MEADOW GRASS.

Glyceria Aquatica—Specific Character:

Panicle much branched, ample (8 to 15 inches,

long); The numerous branches ascending, spreading with age ; spikelets oblong or linear oblong, 5 to 9 flowered, usually purplish (1-6 to 3-12 inches long): Lower palet entire ; leaves large, 1 to 2 feet long 1-3 to 1-2 inch wide. Wet grounds, common Northward. Flowers in July. Culm stout, upright 3 to 5 feet high. Gray.

Like G. Fluitans this grows naturally in and by the sides of pools, and on rich, alluvial soils, more especially on the banks of rivers where it is occasionally covered by fresh water tides.

This is one of the tallest of British grasses, with a powerful creeping root, a native of most parts of Europe, and very common in the fens at Cambridgeshire, England, where it not only affords a rich pasturage in summer, but forms the chief winter fodder. It is sometimes cut thrice in one season, it grows not only in very moist ground but also in very deep water.

In the Isle of Ely, it is so abundant and so much valued that it there forms a great source of their dairy riches being considered excellent food for cows, though not relished by horses. It grows there to the height of six feet ; it is however usually cut when about four feet high and is bound up into sheaves and stacked for fodder.

Immense tracts which were formerly overflowed, are now covered with this plant which from its strong stem and upright growth is suited to places unfit for the finer grasses.

Some of these Glycerias have been sown among the grasses for laying down meadows in wet soils, and for such they deserve attention as they produce great abundance of valuable fodder.

CHAPTER XXVIII

SIBERIAN LYME GRASS.

Elymus Sibericus—Specific Character.

Glabrous: spike wand like 2 to 6 inches long, about 3-12 in thick, often somewhat nodding; spikelets in pairs 3 to 6 flowered: glumes linear lanceolate 3 to 5 nerved. short awned, shorter than the florets, which are rather short awned. South shore of lake Superior and north-westward. Gray, Fibrous rooted, perrennial, height four feet. Flowers in June.

The Siberian Lyme grass does not produce its foliage till rather late in the spring, but it grows rapidly afterwards, and its leaves, which are numerous, long and broad but soft and tender, cover the stem up to near the spike and together with the culm are much relished by cattle either in a green or dried state; although termed a perrennial, it is not so permanent in its duration as some of the other grasses, being more of the habit of the rye grasses in this respect, and like most of them it may no doubt be better fitted for alternate husbandry than for permanent pasture.

The soils best adapted for the growth of Siberian Lyme grass seem to be such as are of a free texture and rather dry than otherwise; when grown on cold, wet soils, its foliage is apt to be injured by rust.

CHAPTER XXIX.

UPRIGHT SEA, LYME GRASS.

Elymus Arenarius—Specific Character.

This grass, which much resembles beach grass, grows from two to five feet high, with a perrennial long, creeping root. Stem erect, round, smooth; leaves long narrow, hard, grayish, pointed, grooved, rolled in, smooth behind and rough on the inner surface. It flowers in July. Differs from the common beach grass in having a short, obtuse, ligule, and spikelets without footstalks, of three or four florets, while beach grass has a long and pointed ligule, and spikelets with footstalks, and of only one floret. Flint.

This grass is not much eaten by domestic animals owing no doubt to its excessive hardness and coarseness. Sir Humphrey Davy found by analyzing the soluble matter afforded by this grass that it contained one third of its weight of sugar, hence it has been, not inappropriately termed, the sugar-cane of Britain, and its hay from this containing a considerable quantity of nutrious matter has been recommended to be cut like chaff and given to cattle either alone or mixed with other food.

The purpose, however, for which this grass is generally employed and for which its creeping matted roots fit it in an eminently degree, is for binding loose sands and preventing the encroachment of the sea, for which purpose it is employed in several parts of Britain, and more extensively on the shores of Holland, and is only to be met with growing naturally in such situations. This grass was introdueed by the Patent office, and cultivated in different parts of the country.

CHAPTER XXX.

HUNGARIAN GRASS, BRISTLY FOX TAIL GRASS.

Setaria Germanicum—Generic Character.

Spikelets altogether as in Panicum proper, and awnless, but with the short peduncles produced beyond them in solitary or clustered bristles resembling awns, (but not forming an involucre). Inflorescence a dense spiked panicle, or apparently a cylindrical spike. Annuals in cultivated or manured grounds, with linear lanceolate flat leaves; properly to be regarded as merely a subgenus of panicum. Name from Seta, a bristle. Gray.

This grass has been introduced into this country through the instrumentality of the U. S. Patent office and is being cultivated throughout the country. J. W. Beardsly, Fairfield Co., Connecticut in Co. gentleman says of it. I have raised Hungarian grass for several years, and have always been well pleased with it Last summer (1873) I sowed eleven acres, and am satisfied that I got twenty-five tons of good, well made hay. Sow it after the ground gets warm, say from the 1st to 15th of June, and it will do to cut about the 15th of August. It grows in a dry, warm soil. I never had any success in sowing grass seed with it. Sow from 20 to 25 quarts per acre. Cut when in bloom.

The Prairie Farmer says the trouble about Hungarian grass is that it is not generally cut at the proper time. I have raised it several years, and consider it the very best hay for horses. They will fat on it when on timothy they will grow poor. I sow half a bushel per acre. Cut it when in bloom, before any seed is formed; wilt in the swath the same as

clover, and make in the cock. The stalk is nearly solid and the hay very heavy; and if made in this way will be as green as grass, and a horse will want little grain for ordinary farm work. I only feed grain in the spring when doing heavy plowing. Give your horses all they will eat of it and they will fat with decent usage. It is better to make it by hand, but on a good soil you will tumble up a big cock in a small space. One advantage in raising Hungarian grass is the lateness it may be sown, for a farmer finding in June that his meadows are light, or his corn a failure, can sow Hungarian grass and make up the deficiency.

Many make a mistake in seeding too soon; the crop will be more or less injured by weeds, which seem to grow under all circumstances. It needs but seventy days of reasonably good weather to make a crop of hay from this grass.

Care should be taken in the curing of this grass for hay. If it musts, or is exposed to the rains much after being cut, it is almost worthless.

Finding my hay crop, in consequence of the dry weather which prevailed during the month of May, and up to the 8th of June, was likely to be a short one, I sowed part of a field with Hungarian grass seed the 9th of June. It has succeeded so far, beyond my expectations, notwithstanding the prevalence of dry weather, which we have experienced since that time, its growth has been steady and rapid, and from present appearances will be ready to be cut and be cured for hay by the 10th of August. I sowed at the rate of half a bushel, or 16 quarts' per acre, but took pains to sow evenly, perhaps 20 quarts for ordinary sowing would be required.

PART SECOND.

CHAPTER I.

The Artificial grasses, belonging mostly to the Leguminosa or Pulse Family of plants cultivated and used both in a green and dried state as food for the domestic animals.

In the preceding pages the most valuable species of the trne grasses belonging to the natural order graminae have received our careful attention. We now enter upon a description of another class of plants called the Artificial grasses, which are equally deserving especial consideration.

The Artificial grasses have been cultivated over two centuries in England. Red clover is supposed to have been grown as a field crop since 1633. In this country; the introduction and cultivation of Red clover dates from 1770, about that time a small quantity of red clover seed reached Philadelphia, and was sown in gardens, and on pasture lots in the neighborhood of the city. In 1773, Mr. James Vaux, of Flatland Ford, Montgomery Co., Pennsylvania, uneble to procure on this side the Atlantic, a sufficient quantity of this seed for his purpose, obtained a

cask from England, which, owing to some injury sustained on the voyage was found unfit for use. This unfortunate circumstance delayed his projected experiment, which would have been the first on a large scale, ever tried in the state. It also prevented an increase and distribution of the seed, until after the war then existing between the colonies and the mother country.

In 1785, this same gentleman sowed eighty pounds of clover seed on thirty-five acres of wheat braird, an account of the success of which he sent to the Philadelphia Society for Promoting Agriculture. To the combined efforts of the members of this Society, whose President, the venerable Judge Peters, one of the foremost men in Pennsylvania, if not in America (at that time) in every useful Agricultural improvement, the country is indebted in a great measure for the introduction and distribution of clover and gypsum.

The seed of the common red clover, Trifolium Pratense, or native red clover (so called in England) also known by the name of marle grass, is believed to be the kind first introduced. In the course of time it passed into varieties, for we find in 1822, that energetic and painstaking seedsman, Robert Sinclair, of Baltimore, describing a new variety. There is, he says, a species of clover, called the tall, or saplin clover, which has the appearance of the common red, but is much taller and coarser, ripens about two weeks later, except its coarseness (which may be corrected by sowing thick) I prefer it to the common kind for sowing with Timothy, as they ripen together, and for improving poor land, it is much the best as it affords a greater covering to the land.

From 1820 shipments of clover seed have been made from Philadelphia to Liverpool, and different parts of the United Kingdom. It is quite probable that the species or variety known in England, as the large American cow clover was introduced about this period. There are at present, three distinct species of red clover, in England, which are cultivated by agriculturists, viz: Trifolium Pratense, Trifolium Perrenne and Trifolium Medium. It will be seen by a comparison of their analyses, that there is not much difference in their nutritive values. There is however, in their perrennial properties, the two latter being more permanent or lasting.

In this country at the present time it may be said that red clover is simply divided into two classes, the large or mammoth, and the trifolium pratense or common clover. Parties who have made a speciality of growing clover seed for market in the western part of the state for the past forty years make no other distinction than the above. The two kinds are essentially different, however, in their properties of growth, &c., which will be treated of under its proper head. Of the many substitutes for clover, which are grown in England, such as lucern, sainfoin, burnet, &c., few of them are cultivated with any degree of success in this country. Although lucern seems to be far better adapted to the climate of this country than that of Britain. Sainfoin I have found to grow well here this spring when other grasses made very little progress. Sainfoin has been cultivated in England since 1651, and is still in high repute. Alyske clover is not receiving the attention to which its superior merits entitle it. The yellew clover or trefoils growing naturally on a

variety of soils throghout the country, on all of which they seem to flourish, are not cultivated to any extent deserving of notice.

To those who follow a system of soiling their cattle during the spring and summer months a variety of Artificial grasses will be found of great benefit. I will therefore proceed to give a description, &c. of the most useful and deserving ones for cultivating.

CHAPTER II.

COMMON RED CLOVER, MARLE GRASS.

Trifolium Pratense—Specific Character.

Stems ascending, somewhat hairy, leaflets oval or obovate, often notched at the end and marked on the upper side with a pale spot, stipules broad, bristle pointed, heads ovate, sessile. Fields and meadows largely cultivated. Gray. Flowers in June, and ripens seeds in July.

WAY'S ANALYSIS.

100 parts as taken green from the field, June 7th.

Water	81.01
Albuminous or flesh forming principles	4.27
Fatty matters	0.69
Heat producing principles, starch, sugar, gum, etc	8.45
Woody fibre	3.76
Mineral matter or ash	1.85
	100.00

In 100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	22.55
Fatter matters	3.67
Heat producing principles, starch, sugar, gum, etc	44.47
Woody fibre	19.75
Mineral matter or ash	9.56
	100.00

Red clover abounds in every part of Europe, and even in Siberia. Although it flourishes in dry, barren and shady places, yet it delights most in such as are rich, moist and sunny. This plant affords a large produce of leaf and blossom, by which the land is preserved in a more perfect state of closeness and shade, while the crop continues upon it, than by any other artificial grasses. It has consequently a greater influence in ameliorating the soils and preparing them for wheat crops to greater advantage. The preparation of land for the reception of clover seed whether sown alone or with a grain crop, is of considerable importance. If the object is to raise a crop for soiling purposes, it should be sown on ground which had produced green crops the previous year (such as potatoes, turnips, &c.) Plowed in the fall and again in the spring, as early as the season will admit, and the clover sown with fertilizers. This will give the clover a chance to get ahead of the weeds, and produce at least one good cutting the first season; otherwise the weeds will overtop the clover, and necessitate their cutting before they go to seed. This will also give freedom of air to the clover and give it a fresh start. In any case it is better to sow clover on clean, fertile land. If on poor land, fertilizers should be freely used, otherwise it is time and money wasted.

The soils best adapted to the growth of clover, as regards its nutritive properties are decidedly calcarious ones, and the same may be said of other grasses as well. No part of Europe, for instance, produces natural grass, of a finer quality than Ireland, and much of it has been immemorially in pasture, but

the surface soil lies almost throughout the island upon a limestone bottom.

A soil to produce good clover crops must have either more or less of lime in its composition. Although I have seen heavy, luxuriant crops grown on peaty soils, but the surface had been pared and burnt previously.

Boussingault found no less than 32,80 per cent of lime in the inorganic constituents of red clover. It is therefore evident that soils which are deficient in calcarious substances must have an application of gypsum, ashes, leached or, unleached or phosphates, else the clover crops will soon be diminished. The action of clover in increasing the fertility of soils, is well explained by Professor Voelcker; he remarks: "All who are practically acquainted with the subject, must have seen that the best crops of wheat are produced by being preceded by crops of clover, grown for seed. I have come to the conclusion that the very best preparation, the very best manure is a good crop of clover. A vast amount of mineral manure is brought within the reach of the grain crop, which otherwise would remain in a lockup condition in the soil. The clover plants take nitrogen from the atmosphere, and manufacture it into their own substance, which, on decomposition of the clover roots and leaves, produces abundance of Ammonia.

In reality the growing of clover is equivalent, to a great extent, to manuring with peruvian guano, and in this paper of mine, I show that you abtain a larger quantity of manure than the largest dose of peruvian guano, which a farmer would ever think of applying." In England the common red clover,

trifolium pratense, is cultivated on a variety of soils, and is sown at different periods or intervals between February and May, either alone or with oats, or rye grass, the latter preferred, as the rye grass shelters it better from the effects of severe frosts. It is, however, considered by the English farmers, inferior to either of the other two kinds as regards its permanency. Its analysis, however, shows that it is superior to trifolium perrenne in nutritive value.

Clover seed should be sown in the spring of the year. The most common practice in the northern states is to sow on the late snows of March or April, on wheat or rye brairds, when sown with spring grain (oats, barly, &c.) Mr. Crozier's method descried on page 29, I consider the best. The common practice is from 8 to 12 lbs. per acre for a separate sowing. 20 to 25 lbs. per acre will be required, contrary to the method used with meadow grass. It is recommended after clover has been cut, that the swaths be not spread out, but suffered to remain on the ground, as left by the scythe or machine, until about three parts dried, then turned, and allowed to dry properly and either cocked up or taken to the barn. A bushel of red clover seed weighs 64 lbs.

CHAPTER III.

PERRENNIAL RED CLOVER.

Trifolium Pratense Perrenne.

This is a variety of Trifolium pratense, but of a more perrennial character, roots longer, and penetrating into the subsoil. The Mammoth Red may

also be classed under this head, although what is known in England as Trifolium Perrenne is not a mammoth clover. Yet both it and what is generally known in the Northern States as mammoth clover, have the same peculiarities in appearance as Trifolium Pratense, by the same colored flowers, leaflets oval or obovate, often notched at the end, and marked on the upper side with a *pale spot*—heads ovate, sessile.

It must be borne in mind that it is only by the cultivator's skilful care that species and varieties of clovers can be preserved and propagated; otherwise, hybridizing or reverting to the original form of the species will be the result or consequence. The Perrennial red clovers are later in flowering and ripening their seeds, than the common red.

WAY'S ANALYSIS.

From 100 parts, as taken from the field June 4th.

Water	81.05
Albuminous or flesh forming principles	3.64
Fatty matter	.78
Heat producing principles, starch, sugar, gum, &c...	8.04
Woody fibre	4.91
Mineral matter or Ash	1.58
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	19.18
Fatty matter	4.09
Heat producing principles, starch, sugar, gum, &c...	42.42
Woody fibre	25.96
Mineral matter or Ash	8.35
	100.00

Perrennial Red Clover is in greater repute with English farmers than the common red.

Whereas the analysis shows that in nutritive qualities the latter is much superior to it. Its chief merits, therefore, must consist in its permanent properties continuing longer in the land than the common red. It produces abundance of seeds, which may be easily collected, and is more frequently employed for laying down lands to grass.

In this country the mammoth red is receiving marked attention at the present time. It is very highly spoken of by the farmers of Virginia and the Western States. W. B. S. L., Virginia, in *Country Gentleman*, says of it: "It is known with us as the mammoth or saplin clover. Its striking peculiarities are the immense growth it attains in rich, loamy soils, yielding probably as much more bulk to the acre as the common varieties of red clover, which it resembles in other respects. It grows as large on thin land as the other on good, rich soils, and takes well on all soils that I have tried it upon. It ripens with Timothy and should be sown with it. As a fertilizer I think it surpasses all other grasses, owing to its immense foliage."

W. W. R., Marietta, Ohio, says of it: "It is certainly a very desirable variety for the purpose of renovating lands, also to sow with Timothy, as it matures about the same period. It is raised in great quantities in the neighborhood of Albion, Mich. It is also well known in Northern Illinois, where it has succeeded well."

In the Northern States this variety is no better than the common red, unless it receives the same care and attention which is usually bestowed on the latter. I have seen the common red growing on fertile soils in the neighborhood of Northport fully equal in point

of luxuriance, and tall, coarse growth, to any mammoth clover I have ever seen, either here or elsewhere.

Mr. Crozier, of Beacon Farm, cultivates this mammoth clover exclusively. By judicious management he keeps it up to a medium standard; avoiding the extremes of coarseness, he secures a hay that possesses the properties and qualities of both sorts combined.

From my experience with the different species and variety of Red Clover, I have arrived at the conclusion that to grow them with any degree of success, attention must be paid to the cleansing and manuring of the soil; otherwise partial or total failures will be the result.

From 8 to 12 lbs. of seeds per acre should be sown on wheat or rye brairds in the spring; from 20 to 25 pounds, if sown alone. A bushel of perrennial Red Clover weighs (same as Pratense) 64 lbs.

CHAPTER IV.

ZIG ZAG CLOVER (COW GRASS.)

Trifolium Medium—Specific Character.

Stem zig zag, smoothish; leaflets oblong, entire, and spotless; heads mostly stalked; flowers a deeper purple, otherwise like the Trifolium Pratense.

OBS. There is a marked difference between this species and Trifolium Pratense and its variety. The stems of the latter are ascending or rising obliquely upwards, while the stems of the former are zig zag; leaflets of Pratense, often notched at the end and

marked on the upper side with a pale spot, whereas in Trifolium Medium the leaflets are entire (not notched) and *spotless;* the heads of Pratense are sessile, those of Medium are stalked and the flowers of a deeper purple, and larger than in Pratense. Flowers in June and ripens seeds in July.

WAY'S ANALYSIS.

100 parts as taken green from the field June 7th.

Water	74.10
Albuminous or flesh forming principles	6.30
Fatty matters	.92
Heat producing principles, starch, sugar, gum, etc.	9.42
Woody fibre	6.25
Mineral matter or ash	3.01
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	24.33
Fatty matters	3.57
Heat producing principles, starch, sugar, gum, etc.	36.36
Woody fibre	24.14
Mineral matter or ash	11.60
	100.00

It is well worthy the attention of the intelligent reader to make a careful comparison of the analysis of the red clovers, which will serve to show that whatever points of difference may exist in their specific characters, there is very little in their nutritive qualities.

This species of clover has been cultivated in England from a very distant period. Mr. Taunton, of Bristol (Eng.) whose useful experiments were so highly appreciated by English agriculturists, assisted largely in attracting notice to this species. He found it to furnish a darker-colored and heavier swath than

any other part of his experimental ground; and, considering that no manure had been applied to this spot during the previous eight years, it served to prove that it would clothe even a light, sandy soil with herbage.

It is of a decidedly perrennial character, and vegetates spontaneously on marly soils, though it has been cultivated with very favorable results on sandy, loamy, and heavy clay lands. The time of sowing in England is from the middle of April till the second or third week in May. It is not so good to sow alone as the common red. It requires a sheltering crop to withstand the severity of the winter, but when once established will remain in the soil for years. This plant is cultivated throughout the Eastern States. It is deserving of a more extensive cultivation than has yet been given it. For separate seeding, 25 lbs. per acre; on grain crops, sow from 8 to 12 lbs. per acre.

A bushel of seed weighs 64 lbs.

CHAPTER V.

WHITE CLOVER (DUTCH CLOVER.)

Trifolium Repens—Specific Character.

Smooth perrennial; the slender stems spreading and creeping; leaflets, inversely heart-shaped or merely notched, obscurely toothed; stipules scale-like, narrow; petioles, and especially the peduncles, very long; heads small and loose; calyx much shorter than the white corolla; pods about 4-seeded;

Fields and copses everywhere. Gray. Flowers in May and during the summer.

WAY'S ANALYSIS.

100 parts as taken green from the field June 18th.

Water	79.71
Albuminous or flesh forming principles	3.80
Fatty matters	.89
Heat producing principles, starch, gum, sugar, etc	8.14
Woody fibre	5.38
Mineral matter or ash	2.08
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	18.76
Fatty matter	4.38
Heat producing principles, starch, sugar, gum, etc	4.04
Woody fibre	26.53
Mineral matter or ash	10.29
	100.00

Trifolium Repens or White Clover is also known under the name of Dutch Clover, from the English having first learned its use from the Flemings, and from large quantities of the seed being imported from Holland. Its favorite soil is limestone, but it is one of the most general grasses throughout England, being found in almost every situation, from the lowest to the highest meadow; though on very poor land it is often so small, and grows in such a creeping manner among the lower leaves of other herbage, that it is scarcely perceptible until brought up by top-dressings, which probably has given rise to the very general opinion that it is indigenous to some soils. The central root penetrates to a considerable depth, and the plant is thereby enabled to resist

the effects of drought, particularly on sandy soils.

The branches which trail on the surface send fibrous roots from their joints down to the ground, and hence this species of clover maintains itself in land of opposite qualities, for if the surface be too dry to afford nourishment to the foliage, it is preserved by the roots. It is not, however, so nutritive as the common annual red clover, nor does it form a good pasture when sown by itself, for it has been found injurious to sheep; but, combined with other grasses, it is a valuable plant. It has been said there is no better test of good land than its running spontaneously to white clover. Its analysis is a good one. From 4 to 8 lbs per acre should enter a mixture with the seeds of other grasses for permanent meadow or pasture.

A bushel of white clover seeds weighs 65 lbs.

CHAPTER VI.

ALSKYE OR PERRENNIAL HYBRID CLOVER.

Trifolium Hybridum.

Alsyke or Perrenial Hybrid Clover, which takes name from the Alsyke district, near Stockholm, was was first introduced into Sweden.

Within the last century vast improvements in agriculture have enabled this valuable clover to be brought to great perfection, and it is now held in high estimation by the Swedish farmers, and extensively cultivated by the leading agriculturists in Great Britain.

The root is fibrous and the heads globular.

The plant bears a greater resemblance to the white than the red clover, and may be described as the giant white clover, with flesh-colored heads. The advantages it possesses over every other variety of clover are: Its perrennial or permanent character; its hardiness, for no winter will kill it; its capability alike of resisting the extremes of drought and wet; the much greater weight of herbage it produces during the season, and the certainty of a plant when all others fail. Its powers of productlon are inexhaustable, and improved by the wonderfully curious formation of the plant, from the single crown of which innumerable heads are continually being produced all through the season, and tillering out laterally over the ground. The hardy nature of the plant is proved by the fact of its thriving by transplanting. A single plant may be taken up and divided into ten or more parts, the fibrous roots just cropped, and each part will produce a luxuriant plant, so that no farmer need ever hereafter have a patchy piece of clover. In England 12 lbs. of seed is used per acre, if sown as a separate crop.

The *Canada Farmer* says of Alsyke Clover: It should be sown in the spring, with wheat or barley, in precisely the same manner as red clover. When allowed to ripen its seed, it cannot be cut more than once in a season, as it bears its seeds with the first blossom in each year; but if it is grown for a hay crop, it can be cut again in the fall, and will yield a nice lot of fine hay for calves and sheep. Its effect on the ground is nearly the same as that of ordinary red clover, and perhaps is still more paralleled by the small white clover. The most prominent advantages of the Alsyke Clover over the common red va-

riety are, that it does not heave out of the ground in spring with the frost, and, consequently, it can be sown on damp ground with good results. It makes finer and better hay, for the stalks are not so thick and woody as those of red clover. It yields about one-third more seed to the acre, and, when threshed. the hay makes excellent feed for calves and sheep. Among its disadvantages may be reckoned its rank growth, rendering it liable to be lodged.

Mr. Chauncy Miller, of the Shaker Family, near Albany, says of it: We find the Alsyke Clover a very superior grass in the following points. 1st. For its value as a hay crop on a great variety of soils. 2nd. For its fineness of stalk or haulm. 3d. For its multitude of sweet flowers, blooming, perhaps, three or four times as much as red clover, making, when in bloom, literally a sea of flowers. 4th. Its adaptability to heavy soils, clays, or heavy clay loams (as well as sandy soils), not being so liable to heave out by frosts in winter and spring as red clover, being the product of a cross between the red and white clovers originated in Germany. 5th. To all farmers who keep bees largely the crop would be of great value in its season of flowering, which lasts about six weeks; the bees are continually on it, "from dewy morn until dusky eve." 6th. To those farmers raising clover seed for market, the Alsyke Clover, in our opinion, would be of great value, as it seeds enormously, and the seed threshes easily, by flail or machine, leaving a beautiful quality of hay, the stalks retaining their greenness when the seed is ripe. 7th. It holds many weeks in bloom, thus giving the farmer lee way of time and weather to secure the hay crop.

T. W. Briggs, West Macedon, in *Country Gentletry, Gentleman*, says of it: The Alsyke is erect and branching like the red, throwing out its flower stalks at every branch, and is in bloom early and late, the lower heads being ripe while fresh blooms are opening at the top, thus affording a longer season for the accumulation of the sweetest of sweets; the flower partakes of the white and red, being a very delicate pink or rose, and the root, in our loamy soils, penetrates to the depth of 18 or 20 inches, and is a tap root, like that of the red clover—hence it may be inferred it is equally as valuable for enriching the soil. For hay, when grown with Timothy, it is much superior to the common red clover, as it is not as coarse, and is more prolific of flowers and seeds. 3 to 4 lbs. of seed is sufficient to seed an acre, with the usual quantity of Timothy, if properly distributed.

The *Scuthern Planter* says: In early spring sowed 1 lb on a quarter acre; it germinated well, and, like red clover, only made a good stand; but in the following spring it came up well, and on the 16th June stood from 20 to 30 inches high, and was covered with blossoms and bees. The bloom is like that of the white clover, folding back in such a way as to enable the bees to get into every part of it, while on the red clover, coming up on the same patch, you seldom or ever see one.

E.T. Bryan, Calhoun county, Mich., says of Alsyke Clover: I have tried Alsyke by the side of red clover, four successive years—seed sown at the same time and in the same field—and find that cattle, horses, horses, and sheep will not graze on the red clover, so long as they can get a good bite on the Alsyke. My experience is, there is no other clover equal to it for

the purposes of feeding cattle, sheep, and horses; and I believe it to be equal to the red clover as a fertilizer. It will flourish on both dry and moist land; does not suffer from the severest frosts or drought, as red clover does; is as free from fuzz or dust as Timothy; hence it will not cause horses to cough or heave as red clover hay does. It will grow from one to two and a half tons of superior hay to the acre, according to the season. It yields two mowings annually, if cut expressly for hay when in full bloom, which, in this latitude, is generally the last of June or first of July. But if cut for seed, it should stand about two weeks later, then affording abundance of superior pasturage for all kinds of stock. The seed is cut from the first crop.

The Alsyke, when left to seed, has its stalks yet green when its seeds are ripe, and produces much better hay than the red clover, when cut for that purpose.

From 3½ to 4 lbs. per acre, when sown with wheat, rye, oats, or barley, is sufficient. It generally yields from 3 to 8 bushels of seed per acre.

CHAPTER VII.

YELLOW CLOVER, HOP TREFOIL OR SHAMROCK CLOVER.

Trifolium Procumbens—Specific Character.

Stems spreading or ascending, pubescent (3 to 6 inches high); leaflets wedge obovate, notched at the end; the lateral at a small distance from the other (pinnately 3-foloilate); stipules ovate, short. Sandy

fields and roadsides. New England to Virginia. Gray.

Flowers in June, and ripens seeds in July.

WAY'S ANALYSIS.

100 parts as taken green from the field June 13th.

Water	83:48
Albuminous, or flesh forming principles	3.9
Fatty matters	.77
Heat producing principles, starch, gum, sugar, etc	7.25
Woody Fibre	3.74
Mineral matter or ash	1.37
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	20.48
Fatty matters	4.67
Heat producing principles, starch, gum, sugar, etc	43.86
Woody Fibre	22 66
Mineral matter or ash	8.33
	100.00

The shamrock clover grows naturally on dry, gravelly places, and has been recommended for growing on such soils as are incapable of supporting the more valuable grasses and clovers; but, from the small bulk of produce which it yields, the propriety of its cultivation is questionable, and, besides, cattle are not found to relish it if they can procure more nutritious food.

It is also very liable to be injured by mildew. Trifolium Procumbens is readily distinguished from Trifolium Filiforme, by its more compact, upright, and branching habit of growth, and by its close, globular, shining heads of yellow flowers.

CHAPTER VIII.

YELLOW-FLOWERED CLOVER, OR SLENDER YELLOW CLOVER—COMMON SUCKLING CLOVER.

Trifolium Filiforme.

Grows naturally on dry, rocky, or gravelly places. Common Suckling Clover has been recommended, same as Trifolium Procumbens, for growing on dry, rocky or gravelly places, which are incapable of supporting the more valuable grasses or clovers. Like Trifolium Procumbens, cattle are not found to relish it, if they can procure more nutritious food. Although generally termed an annual, Trifolium Filiforme is often found of biennial duration, especially when grown in medium good soil, or when eaten down by cattle or sheep.

CHAPTER IX.

ITALIAN, OR FLESH-COLORED CLOVER.

Trifolium Incarnatum.

Observation. The whole plant villose, or covered with short wool or hair. Flowers in June and July.

Height 18 inches to 2 feet; root annual.

A native of Italy.

WAY'S ANALYSIS.

100 parts as taken green from the field, June 4th.

Water	82.14
Albuminous or flesh forming principles	2.96
Fatty matter	.67
Heat producing principles, starch, sugar, gum, etc.	6.70
Woody fibre	5.78
Mineral matter or ash	1 75
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	16 60
Fatty matter	3.73
Heat producing principles, starch, sugar, gum, etc.	37.50
Woody fibre	32.39
Mineral matter or ash	9.78
	100.00

The Trifolium Incarnatum has long been known in England amongst horticulturists as a beautiful border annual. But is is only since 1830 that its cultivation has been recommended, as yielding an excellent and abundant crop of fodder for feeding cattle. It has been grown with much success in the southern counties of England.

In Scotland it has been found to succeed well, when sown on stubble after the oats or barley has been removed, with no previous preparation, save a course or two of harrowing, just sufficient to stir up the soil to the depth of an inch or two, so that the seed may be more easily covered.

It was first introduced into this country in 1818, by Mr. B. Hands of Chester Town, Penn. The year previous he had been traveling in Italy.

He thus describes it in its native fields: In making one of the usual excursions from Naples his atten-

tion was arrested by the sight of a small field of this clover, exhibiting a fine, compact crop, with long blossoms of the most sparkling scarlet, at least three feet in height. Its great superiority in growth and beauty to any kind of clover he had ever seen, immediately induced him to obtain information respecting it; also some seed. He was told that it was much preferred to the English clovers. He procured a quantity of seed in the chaff, and, on his return home in the fall, sowed some for experiment, to ascertain whether the winter would prove too severe for it, or materially affect it. He found it to stand the winter well. This was the first introduction of it into Pennsylvania, and it attracted the attention of the leading agriculturists of the country at the time, but failed to supplant the red clover, nor does it appear to have been cultivated to any extent as a field crop at any time since (in this country). This grass should be sown in early spring, or else in July, for soiling and mowing before winter.

The seed is always for sale in the principal seed stores throughout the country.

CHAPTER X.

EGYPTIAN TREFOIL.

Trifolium Alexandrinum.

Remarks.—Height, 18 inches to 2 feet. Flowers in June and July.

Native of Egypt.

As an agricultural plant, the introduction of the Alexandrinum into England is more recent than that

of the Trifolium Incarnatum, compared with which it is of a taller and more straggling habit of growth, and is not so well clothed with leaves; it is also a few days earlier in flowering. It should be sown the latter end of August for an early spring crop, and it has been suggested that one or both might be sown in spring, along with the Italian rye grass, for summer feeding, instead of the common tares, particularly since they are found to be less injurious to the soil.

The same practice of preparing the ground for this as is used before sowing the Trifolium Incarnatum, only the ground should be more pulverized. I am not aware of this plant having been introduced or cultivated in this country.

CHAPTER XI.

COMMON BIRDS FOOT TREFOIL.

Lotus Corniculatus.

Remarks. Flowers eight or ten in depressed heads, generally of a bright yellow, but sometimes orange colored, especially before being fully expanded. Stem decumbent, thick and fusiform.

Perrennial, flowers about the 20th of June, and continues till the end of August; height from 6 inches to one foot. Grows abundantly on dry, elevated pastures and heathy soils.

This plant is well deserving of cultivation on light, dry, and high elevated inferior soils, and, on such will yield a greater bulk of herbage than any of the cultivated clovers. It is highly nutritious and eaten

with avidity by cattle. From the depth to which its roots penetrate, it is not liable to be injured by drought, and is thereby enabled to retain its verdure after the grasses and other plants are burned up.

CHAPTER XII.

THE GREATER BIRDS FOOT TREFOIL.

Lotus Major.

Remarks. Some eminent botanists are of the opinion that this is nothing else than a variety of Lotus Corniculatus and account for the difference from the natural place of growth of the L. Major, causing a greater development of its parts, but besides its more luxuriant habit, it differs materially from L. Corniculatus in the form of its roots, which are fibrous and creeping, while those of the latter are thick and fusiform, characteristics which both retain when cultivated in any soils under any circumstances, the seeds of Lotus Major being only half the size. This specie grows naturally by the sides of ditches, damp hedges and bushy places, and attains its greatest luxurience in such soils as have a portion of peat for their composition. Both those plants are very common in pastures throughout Great Britian.

CHAPTER XIII.

LUCERNE.

Medicago Sativa—Specific Character.

Upright, smooth, perrennial, leaflets obovate, oblong, toothed; flowers (purple) racemed; pods spirally twisted. Cultivated for green fodder, rarely spontaneous. Flowers in July and ripens seeds in August.

WAY'S ANALYSIS

100 parts as taken green from the field May 16th.

Water	69.65
Albuminous or flesh forming principles	3.83
Fatty matters	.82
Heat producing principles, starch, sugar, gum, etc	13.62
Woody fibre	8.74
Mineral matter or Ash	3.04
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	12.96
Fatty matters	2.76
Heat producing principles, starch, sugar, gum, etc	40.16
Woody fibre	34.21
Mineral matter or Ash	10.11
	100.00

Lucerne was introduced into British husbandry about the middle of the 17th century, and has ever since been cultivated successfully in the British Isles. It still continues a favorite plant for soiling purposes. It may be sown broadcast, drilled or transplanted, all of which methods have been successfully practiced. The proper time for sowing in England is toward the middle or end of March, or not later than April, because like the turnip, Lucerne is subject to

the ravages of the fly, and by early sowing it will attain a sufficient degree of growth so as not to be affected by the attacks of the insect. Lucerne has also been introduced and satisfactorially cultivated in this country during the past fifty years.

Vanbrugh Livingston, of Westchester Co., N. Y. State whose high opinion of Lucerne, was fully borne out by his previous successful cultivation of it, said of it in 1827 "Although the virtues of Lucerne have been most largely descanted on by British writers, it is a plant which is far better adapted to our own climate than that of Britian. The latter country it would appear, does not possess the requisite degree of heat and dryness to insure the full advantage of its real value.

And it seems to be expedient, if not necessary in that country, to cultivate it at the expense of drilling, while here it answers with perfect success in the easier and cheaper mode of broadcast.

Judge Buel, of Albany, commenced growing it in 1820. In 1824 he sowed 16 lbs of seed, on an acre (well prepared by manure and potatoes the preceding year) with half a bushel of winter rye, the whole sown broadcast. The ground was well harrowed and rolled after it was sown. The rye soon spread its leaves upon the surface and protected the Lucerne until its roots had good hold of the soil. It grew well notwithstanding the drought. The latter end of Augnst, perceiving that some of the rye was pushing up seed stalks, he mowed it and fed it green to his cattle. In 1825, he cut three tolerable crops and soiled it to his cows. In 1826 he cut it four times for green fodder, and in the Antumn gave the field a slight top dressing of rotten dung. In 1827, May

the 20th, he commenced cutting and feeding his Lucerne morning and evening to his cattle; this year he cut in all three crops, and a fourth might have been cut only for the difficulty in curing it." He further says, "It should be cut for soiling as soon as the blossoms appear, and allowed to wilt a few hours in the swath before it is fed to the cattle, and lastly, like all other crops, it is benefitted by an occasional top dressing of manure."

In 1862, on Mr. Peter Lorrillards Farm, in Westchester Co., N, Y. State, there was four acres of ground well prepared late in the spring and sown broadcast, with Lucerne without any other crop, did not cut it that season, but the following year cut it four times, and it continued yielding well for several years.

Lucerne has been cultivated for many years in Lower Canada. Its growth upon the farms of the late Mr. Logan, and others in the neighborhood of Montreal has been quite a success, resisting the severity of the Canadian Winters, it pushes forth with vigor in the spring and increases in luxuriance from year to year. It is generally fit for cutting a fortnight earlier than red clover. It starts with remarkable vigor immediately after being cut, and in the course of a week the field is again covered with verdure. Lucerne requires a deep soil. Although if sown on a dry, light soil, it will extend its roots downward to a great depth, and will show increased luxuriance of growth year after year. It may be sown from the middle of April till the middle of August. I sowed about half an acre (broadcast) the 25th of June, this year; it is now (7th August) 18 inches high (in flower), and fit for cutting. If the

ground has been previously well prepared, sow broadcast, at the rate of 16 to 20 lbs. per acre, with half a bushel of rye, oats, or barley. As a rule, cut when in flower for soiling. It may be drilled to advantage, in drills twelve inches apart; 15 lbs. of seed per acre, if drilled; 25 lbs. per acre, if broadcast.

If Lucerne can be grown successfully in Canada, it certainly may be grown with equal success in many parts of the States.

A bushel of Lucerne seed weighs 60 lbs.

CHAPTER XIV.

BLACK MEDICK, NONESUCH, LUCERNE, RESEMBLING HOP TREFOIL.

Medicago Lupulina—Specific Character.

(Black Medick Nonesuch)—Procumbent, pubescent, annual leaflets, wedge obovate, toothed at the apex; flowers in short spikes (yellow); pods kidney form, one-seeded. Flowers in May and ripens seeds in June.

Observation. Stems trailing, unless supported by the plants with which it grows; about a foot long, somewhat angular, slightly hairy, branched. Leaves obovate or wedge-shaped, toothed towards the top; the mid rib lengthened out to a short, broad point; soft pubescent, particularly on the under side. Flowers small, yellow—from thirty to forty, and upwards, in a head, which is at first roundish, afterwards oval.

Legume striated and wrinkled, somewhat hisped, with rigid hairs, turning black when ripe; seed

ovate, smooth, yellowish. This plant has such a general resemblance to the proper trefoils or clovers, that it is often mistaken for some of the smaller species. The form and color of the seed pods afford a ready mark of distinction. Root annual; in some situations, biennial.

WAY'S ANALYSIS.

100 parts as taken green from the field June 6th.

Water	76.80
Albuminous or flesh forming principles	5.70
Fatty matters	.94
Heat producing principles, starch, sugar, gum, etc.	7.73
Woody Fibre	6.32
Mineral matter or Ash	2.51
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	24.60
Fatty matters	4.06
Heat producing principles, starch, sugar, gum, etc.	33.31
Woody Fibre	27.19
Mineral matter or Ash	10.84
	100.00

The common yellow clover, as this plant is generally termed in England, is too well known to require a lengthy description of it. It has been cultivated in mixture with red clover and rye grass for a great length of time. Its seeds, which are produced in much greater abundance, are, consequently, cheaper than those of the other clovers. The seed of this plant falls so readily that great loss ensues from moving it, and in threshing the least stroke clears it. This plant is adapted for light soils which have been subsoiled, as the root penetrates to a considerable

depth, and is but little fibrous. On accouut of it being an annual, or at best a triennial, it is only fit for alternate husbandry, and, as stated above, to enter into a mixture with red clover, rye grass, or Timothy, for a short rotation. The analysis, however, shows that in albuminous, fatty matters and heat-producing principles, it is very little inferior to the red clovers.

Medicago Lupulina was introduced into this country from England many years ago, although little attention has been paid to its cultivation. From 4 to 6 lbs. of Nonesuch or Yellow Clover seed, with the usual quantity of red clover seed, should be sown per acre.

CHAPTER XV.

SAINFOIN OR COCKSHEAD.

Onobrychis Sativa—Generic Character.

Keel transversely obtuse ; legume jointed, with one seed joint.

Specific Character. Legume one-seeded, prickly ; wings of the corrolla, equal in length to the calyx stems, elongated, nearly upright; roots subfusiform, and penetrating to a considerable depth ; perrennial ; height, two to three feet. Flowers in June and July.

WAY'S ANALYSIS.

100 parts as taken green from the field June 8th.

Water	76.64
Albuminous or flesh forming principles	4.32
Fatty matter	.70
Heat producing principles, starch, sugar, gum, etc	10.73
Woody fibre	5.77
Mineral matter or ash	1.84
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	18.45
Fatty matter	3.01
Heat producing principles, starch, sugar, gum, etc	45.96
Woody Fibre	24.71
Mineral Water, or Ash	7.87

France is considered the country most favorable to the growth of Sainfoin. In Europe it is commonly called French grass (Sainfoin Holy Hay). In Switzerland and other mountainous countries, Sainfoin is a main dependence, because in many parts of those countries the finer grasses will not grow profitably.

Sainfoin has long been cultivated in England, and is found growing wild in nearly all the chalky districts of the kingdom. Parkinson, in 1640, said of it: "It is generally known to be a singular food for cattle, causing them to give great store of milk."

Worlidge, in his Mystery of Husbandry (1681), treats of Sainfoin at large. He says: "In Wiltshire, in several places, there are precedents of Sainfoin that has been there twenty years, growing on poor land, and has so far improved the same, that from a noble per acre, twenty acres together have been certainly worth thirty shillings per acre, and still continues in good proof."

For a period of two hundred years, Sainfoin has been cultivated in England, and for many years in Scotland. Its cultivation is still an important feature in British husbandry. Morton's *Farmer's Calendar* (Eng.), 1874, states: "There are many parts of the United Kingdom in which the farmers could not pay their rents without the use of this crop. Chalky soils, and sand upon chalk, are its favorite soils; also loams and clays, if not too stiff or too deep. On limestone it does well, too—on very dry, sound gravels—but not if the under stratum be mixed with clay. I have tried it without success on good, dry turnip loam, but on every species of chalk and white marl its success is certain. On poor sand lands in Norfolk and Suffolk, worth only five shillings per acre, the crop for several years (after the first) has been from one to two tons and a half per acre of excellent hay, mown every year. Whatever the price of hay may be, such a produce on such land is prodigious, with the additional circumstance of an after-grass extremely valuable for weaning and keeping lambs. In England, March is ths principal month for sowing Sainfoin. It may, hovever, be safely sown in April. The land should be clean and free from weeds and the seeds of weeds, and this is the principal circumstance to attend it. It should be sown with barley or oats—the land in fine tilth—and the seed covered by harrowing. When the land is dry, the proper quantity of seed is 4 bushels (rough seed) per acre. It flourishes so well broadcast that there is no necessity to attempt the drill method."

Sainfoin was introduced into the State of Georgia by the Honorable W. H. Crawford, about the year 1820. Judge Peters, of Pennsylvania, experimented

with Sainfoin during several periods of his life; also Governor Morris, of New York State; but neither were successful in its cultivation.

Although Sainfoin has been introduced and cultivated in the Eastern States and States of New York and New Jersey, there is no mention of satisfactory results being obtained on a large scale in its cultivation. I sowed a small quantity for experiment, on the 18th of last May, and it has succeeded remarkably well; notwithstanding the hot weather during the months of May and June, it progressed finely, and was very little affected by the drought; it is now in flower (end of July), and will soon be fit for cutting. On the whole, it has done better with me than any of the clovers I have sown this spring. Its analysis shows that either in a green or dried state, it compares favorably with any of the clovers in flesh-forming principles, fatty matters, and heat-producing principles; and from the long period of its cultivation in Great Britain, and the high estimation it is held in for cultivation on the inferior soils already stated, its value as a hay crop (and no grass requires so little pains in curing as Sainfoin) cannot be overestimated. It is well worthy of a more extended trial than has yet been given it in this country.

Its seeds are larger than many other grasses, and require a little deeper covering. The best seed has a bright husk, the kernal being plump, externally of a bluish or gray cast, but when cut internally of a fresh, greenish color. The seeds weigh 23 lbs. to the bushel.

CHAPTER XVI.

BURNET.

Poterium Sanguisorba—Specific Character.

Leaves compound leaflets, serrated or toothed; stems somewhat angular, branching stamens much longer than the calyx; perrennial; height, 2 to 3 feet. Grows naturally on chalky pastures in England. Flowers end of June, and ripens seed end of July.

Burnet abounds much on all chalky downs in England, but will flourish on any soil, whether, sand, clay, peat, etc. It is remarked that there are large tracts of the finest parts of the South Downs upon which this plant forms half the indigenous pasturage.

Burnet has a perrennial root, that strikes deeply into the soil and rises with a stalk, a foot or more in height. In the culture of the plant it is of vast importance to have good seed, and such as is of the proper sort.

The celebrated agriculturist, Mr. Coke, of Holkham, sowed forty acres with Burnet, adding a small quantity of white clover and rib-grass seeds with it, as an experiment. The result was decisive. The field was fully and incessantly stocked with sheep, and constantly pared as close to the ground as a favorite spot could be by horses in a pasture.

Burnet is frequently sown alone, and is considered as the best adapted of all forage plants to bear the rigor of winter in exposed situations. It is, therefore, much used by stock masters, particularly for

sheep, as it supplies an important addition of food in the pinching season of the early part of spring. But if made into hay, when uncombined with other grasses, it is coarse and unpalatable. By itself it is, indeed, an inferior food, for although it possesses a tonic and aromatic property, which renders it of considerable value when mixed with the grasses of the elevated pastures of the Downs, and it is there invariably cropped close to the ground, yet, if grown separately, it is rejected by stock, unless pressed by hunger. When intended for summer pasture or hay, it should, therefore, be joined with other grasses, or at least with white clover, which will both render it more palatable, and afford a heavier crop, than if sown alone.

On poor, chalky soils it has also been tried with good effect, in combination with cocksfoot, and also with small quantities of meadow fescue and perrennial fescue, and its hardy nature on soils of that description renders it worthy of attention.

After it has been sown, whether for seed or a second crop of hay, the stock should be kept from it during the whole of the autumn and winter, that there may be a full bite for sheep in the spring; for this is its peculiar advantage, and its utility in a great measure depends upon it; at least Burnet is much less beneficial under the contrary management.

The proportion of seed is generally about one bushel to the acre, and the most proper season is early spring. It is usually sown with barley or oats, and covered in by two harrowings. It may also be sown, with buckwheat in May with much propriety.

When mixed with rye grass or cocksfoot seeds, one bushel of either of them to three pecks of the Burnet seed has been frequently used.

CHAPTER XVII.

COMMON VETCH, OR TARE.

Vicia Sativa—Specific Character.

Somewhat pubescent, stem simple; leaflets 5 to 7 pairs, varying from obovate oblong to linear. notched and mucronate at the apex; pod linear, several seeded.

Flowers in June and during the summer.

Observations.—The stalks are round, weak, branched, and about two feet long; pinnea five or seven pairs, a littlr hairy, notched at the end; stipulea denotated; flowers light and dark purple, on short pendicels, generally two together; pads erect; seeds black.

WAY'S ANALYSIS.

100 parts as taken green from the field June 13th.

Water	82.90
Albuminous or flesh forming principles	4.04
Fatty matters	.52
Heat producing principles, starch, gum, sugar, etc	6.75
Woody fibre	4.68
Mineral matter or ash	1.11
	100.00

100 parts of the grass dried at 212° Fahr.

Albuminous or flesh forming principles	23.61
Fatty matter	3.06
Heat producing principles, starch, sugar,gum, etc.	39.45
Woody fibre	27.38
Mineral matter or ash	6.50
	100.00

From its tall, close, hardy growth, and succulent nature, this plant is capable of being introduced with considerable advantage after the manner of artificial grasses, between different kinds of grain crops, without exhausting the land of its fertility; at the same time, it will afford a useful supply of green or other provender for the consumption of different sorts of cattle. Writers on agriculture distinguish two species of the common tare, namely, the spring and winter tare. Probably one is only a variety of the other. The former is much less hardy than the latter or winter tare, the plants of which are capable of resisting the effects of the most inclement seasons.

Several experiments have been made in order to ascertain the difference of the two, relative to their hardiness, which has always resulted in showing that there is an important difference in the constitution of these two kinds of tares. The seeds of the spring and winter tares being nearly alike in every characteristic, are not easily discriminated; but the distinction is at once evident on the appearance of the blade. The spring tare vegetates with a grassy spear of a dusky brown color, whereas, the winter tare comes up with a seed leaf of a fresh, green color.

With respect to soil, this plant is almost without limitation, as it will grow on all the varieties,

from the superficial gravel to the deep, stiff clay; yet on gravelly loams, when too much moisture does not prevail, it flourishes most vigorously.

In the vicinity of London, some years ago, as high as one hundred dollars per acre has been realized by farmers from the sale of tares to people who used to make them up in bundles of thirty pounds each, and retailed them to trades people who kept horses about the metropolis.

In this manner, the product of a vast number of acres was consumed, with great advantage to the farmer.

Vetches are being successfully cultivated in the Middle or Eastern States. Winter vetches cannot be sown too early after the oat crop has been harvested, though they may be sown through the months of August, September, and the early part of October. If the soil be poor, or the situation elevated and exposed, sow in August, and upon every farm on which they are cultivated, it is advisable to sow some of them early and others late, in order to have a succession of green food the ensuing summer. Spring vetches produce rather a lighter crop than the winter sort, and are subject to more risk from a dry summer. There is no difference in their use or value per ton; but the spring coming to maturity two or three weeks later, makes it convenient and advisable to grow some of each, in order to have a succession of them for green food all the summer. They may be sown all the spring and summer, from April until the middle of July; but the success of late sowing will depend upon the showery season. After ploughing for winter vetches, spread (if not already ploughed in) manure or fertilizer, and sow your vetches upon

it, and harrow and cover in two bushels and a half of tares, mixed with one bushel of rye—or three bushels of tares alone will be sufficient—and in the following spring, when the soil is dry, roll it just enough to smooth the surface for more conveniently mowing the full crop.

About the 1st of June they will begin to blossom, when they may be daily mown, and fed to cattle, sheep, and swine ; for horses, they should be allowed to wilt before using them.

There is no herbage more grateful to the horse, cow, or sheep, in the hot season of July, than the juicy vetch. And for milch cows, particularly, the flow of milk will be increased, the butter of prime quality, and the advantages derived from the growth of this early forage plant will soon manifest itself.

CHAPTER XVIII.

CHICORY, OR WILD SUCCORY.

Cichorium Intybus—Specific Character.

Stem leaves oblong or lanceolate, partly clasping the lowest runcinate, those of the rigid flowering ; branches minute. Gray. Flowers in July and ripens seeds in October.

In England the Cichorium Intybus, Wild Succory, or Chicory, grows naturally by the side of roads, and in shady lanes. It sends out long leaves from the roots, from between which the stalks arise, growing to the height of three or four feet, and branching out into smaller ones.

The flowers come out from the sides of the stalks, and are of a fine, blue color. They are succeeded by oblong seeds, covered and enclosed in down. This succulent perrennial plant is cultivated for the purpose of supplying different sorts of live stock with green food during the summer.

Most loamy soils are capable of producing it, and on some of the light, moist sorts of land, it may be grown; but in those that are not too retentive of moisture it succeeds the best.

It answers well where clover is worn out: and on boggy and peaty lands it thrives to a very profitable end. Chicory is sown with both barley and oats, but it is evident that the latter will admit of the more early sowing.

When sown by itself, any time from the first of April until the first or middle of August will do. It ought not to be cut more than twice in the first season, though the operation may be performed three or four times in the following summer. It is not well suited for conversion into hay, but may be used in a green state with advantage.

As chicory is not so much injured by close feeding as many other plants, and is useful for feeding cows and sheep, it is found to answer admirably well as pasturage for this kind of stock.

The usual proportion of seed, whether sown alone or with grain in the spring, is from 10 to 15 lbs. per acre. When sown in the spring with clover, sainfoin, burnet or rye grass, four pounds is sufficient per acre.

CHAPTER XIX.

RIB GRASS.

Plantago Lanceolata—Specific Character.

Natural order, 62, (Plaintain Family) Genus 1. Mostly hairy ; scape grooved angled, at length much longer than the lanceolate or lance, oblong leaves, slender (9 in. to 2 ft. high, root perrenniel. Gray.

The rib grass produces its foliage at an early period of the season, when it is eaten by cattle, sheep and horses, on which account its mixture with grasses on dry pastures has been much recommended and practiced. In England and Wales it has been frequently sown without admixture, and produced considerable herbage on rich sands and loams, and on poorer and drier soils answers well for sheep ; being much used on the hills of Wales, where its roots spread and occasion a degree of fertility in districts which would otherwise be little better than bare rock.

Rib grass, Ripple grass, English Plaintain, by all of which names this grass is called, is so well-known in this country, that further description of it is unnecessary.

CHAPTER XX.

YARROW.

Achillea Millefolium—Specific Character.

Natural order 53. (Composite Family) Genus 53. (Common Yarrow or Milfoil). Stems simple; leaves

twice pinnately parted; the divisions linear, 3 to 5 cleft, crowded; corymb compound, flat topped; involucre oblong; rays 4 to 5 short, white (sometimes rose-color). Fields and hills; common northward. Gray.

Flowers the end of June or beginning of July.

Yarrow is one of the most common, as well as one of the most valuable of the artificial grasses, as it has been found to form part of all the richest of the English pastures, and is so grateful to every species of stock, that it is close fed down as fast as it springs, thus frequently escaping observation, unless the turf be attentively examined; it is considered beneficial to stock rather as a condiment than as affording nutritive matter. It suits almost every species of soils, and posseses, besides, the faculty of resisting drought on arid land.

The successful cultivation of this grass in the beginning of the present century, by Dr. Anderson, a distinguished agriculturist in England, established its reputation as a highly useful grass for sheep pastures.

At least 6 or 8 lbs. of the seeds of this grass should enter a mixture of other grasses, to be sown for permanent pasture where sheep are largely kept.

CHAPTER XXI.

INDIAN CORN.

Zea, Maize—Generic Character.

Spikelets two-flowered; flowers monœcious, the staminate in terminal panicles; glumes 2; pales

awnless, obtuse; the pistillate or fertile spikelets two-flowered, with the lower one abortive; glumes 2, obiuse; pales awnless; fruit compressed. Flint.

Indian Corn, although one of the ceralia (or grasses cultivated for their seed), is a true grass, and cultivated both for summer soiling and winter fodder. For either purpose it should be got in as early in the spring as the season will permit. There are various methods adopted in the cultivation and curing of this crop.

On a small scale, I tried three-quarters of an acre last year (1874) for experiment; ploughed the ground early in May; harrowed and opened drills with a one-horse plough, three and a half feet apart; manured as heavily as I would for potatoes, and sowed seed on manure, at the rate of two bushels per acre, and covered lightly with hoe (on a large scale, I cover lightly with one-horse plough), as soon as it made its appearance in the rows, kept the cultivator at work until it was no longer necessary to do so; commenced cutting for cattle the end of July, and about the 20th August had the balance cut and put up in small stacks, and allowed to remain in field until wanted.

An excellent plan, and well worthy of a trial, is one recommended in *Country Gentleman*, viz.: Place three rails or poles, upright, within a foot, or less, of each other, touching at the top, or with a small block placed between them. They should be set in the ground far enough to stand well, with a band around the upper end to hold them together; or, if they are merely poles, the lower ends may be sharpened and more easily set in crowbar holes. The stalks are now stacked around the poles, which form

a chimney for the escape of moisture and heated air.

The stacks should be made narrow and tall, and each one should not contain more than a ton—better much less—and allowed to remain in field until thoroughly cured.

Mr. W. Crozier, Beacon Stock Farm, one of the most successful cultivators of corn fodder perhaps in the country, not only gives it a rich field, but manures heavily in ploughed furrows, sowing drills a foot in breadth over the manure. He uses seed of large varieties, cultivates well, and secures enormous crops. The seed may be sown from a basket on the manure, covered by ridging with a plough, and then harrowing down lengthwise, so that the corn will have but two or three inches of covering.

He cuts as soon as the edges of the leaves begin to wither, puts up in stacks well secured at the tops, which are allowed to remain in the field as late in Autumn as will be quite safe from the weather, or till a suitable opportunity occurs for drawing into stackyard.

A cheap and substantial platform is made of poles, surported by sleepers on short posts. On this platform of poles the fodder is stacked when drawn, and additional ventilation is secured by making ventilating chimneys at intervals, by means of barrels furnished with a handle or cross-rope, by which they are drawn upwards as the stack is built. Fodder thus secured becomes well dried, and proves of great value.

Corn for fodder may be sown from the first of May till the middle of July. The later the sowing the earlier must be the corn used. The essential points in raising good corn fodder are—1st. Rich, warm,

dry land. 2d. A medium seeding. 3d. Sowing in drills wide enough apart to allow the use of a horse hoe. 4th. Thorough cultivation.

The drill system is practiced in the western parts of New York State with encouraging results. The land undergoes a thorough preparation before the seed is sown, by manuring, ploughing, harrowing, and dragging. As the crop is needed to mature at different periods through the season, the first sowing takes place about the 1st May. Western seed corn is sown with a drill, three and a half to four bushels per acre being used on as mellow a surface as the cultivator, drag, and roller will make. This gives clean culture, level surface, and rapid growth. The second sowing on 20th May, again on the 10th June, and balance July 1st. At the proper time, before any frost, a combined mower and reaper, rigged exactly as in cutting wheat, is used, the ground being rolled smooth before drilling. The machine is driven around the piece, cutting just as easily and as rapidly as in oats or wheat, a young lad following to remove the bundles, at the corners, out of the way of the team in turning. It cures in three or four days enough to bind. Then it is stacked up, putting eight bundles in a bunch, securely tied at top. In this way it becomes well cured when wanted for use, and is all eaten, being green and fresh in color, and exceedingly sweet. Some draw it into the barn in the fall. Others allow it to remain in the field, and draw as needed. The advantage of drilling is, the stalks are not so large and woody, and are all eaten; don't require any culture with a horse; there are less weeds; more ease in binding and handling, and less expense in cutting.

Broadcast sowing has been practiced, and although successful in many instances, is not as proper a method for the cultivation of this crop as the drill or row system. When sown broadcast, it is either cut down with a machine or scythe, and removed to a grass lot and cured as hay, and put up in cocks and allowed to remain until thoroughly cured, and, like the grass, should not be cut until after the flower disappears and the seed begins to form.

Corn fodder, if properly cured, is one of the best and cheapest kinds of food for animals in winter. It is eaten up clean, both stalks and leaves, and, in this respect, it is greatly superior to common husked corn stalks; and on good, rich, moist soils, sown in drills, and kept well cultivated, as much as six tons per acre has been obtained.

PART THIRD.

CHAPTER I.

The Order Graminæ, or Grass Family, are arranged into genera, species, and varieties, which assist the memory in retaining the discriminating characters, or specific marks, by which every species and variety of grass is distinguished from all others. This is of particular value to the farmer, whose occupations allow not, perhaps, the time and attention requisite to obtain general botanical knowledge, and whose purpose here is only the attainment of a perfect knowledge of the comparative merits and value of this tribe of plants, exclusively agricultural, and which constitutes the foundation of the riches of a farm. The bare enumeration of the different species and varieties which comprise this agricultural family of plants, will be sufficient to show the importance and usefulness which some degree of botanical knowledge is to the farmer; or how much light and order are preferable to darkness and confusion, certainty to uncertainty—or, in a word, science to empiricism.

The time and attention requisite to obtain this degree of botanical information by any practical farmer, are, indeed, but small; and no person once in possession of this knowledge has ever yet been found to regret the acquirement of it, or to say that it is not of great utility and benefit in practice.

Every species of grass, properly so called, is distinguished from all other plants by the following peculiar structure: the stem or straw is usually hollow, and closed at the joints, with leaves in two alternate rows; leaves are long, slender, and entire, sheathing or investing the straw for some length, and in number equal to the joints of the straw or stem.

The flowers are in little spikelets, held in two-rowed glumes or bracts, the outer glumes generally two in number, and unequal. The stamens vary from one to six, but are usually three in number. The ovary is simple, with two styles, and two feathery stigmas; and the fruit is enclosed in a husk, called a caryopsis.

Every plant, therefore, that possesses all these peculiarities of structure, is a proper species of grass; hence the proper grasses are called a natural order of plants.

But besides this agreement of external structure, grasses are distinguished from other natural orders of plants by this property, that every part of the plant becomes food for the larger and more valuable domestic animals. The parts of fructification—the flower and the seed—are the least liable to vary from any change of soil or cultivation; and botanists have chosen them, on that account, to fix their generic distinctions, or, when the flowers and seeds of any

number of grasses agree in one or two particular points, and differ therein from all the rest, such are termed a genus or family.

The difference in the manner of inflorescence, and the form of clothing of the culm, leaves, and roots, afford the specific characters, or separate the genus into species. When the difference between two grasses amounts to little else than one or two of these last-mentioned points, or when such distinctions are either lost or found by raising the plant from seed, it is then called a variety.

These characters of genera, species, and varieties, being founded on a few parts only, and those frequently not very obvious, have been termed artificial characters of distinction. The memory, by these means, is relieved from a multiplicity of minute distinctions, which would not be the case were all the parts of the plant included in the essential specific description or character.

CHAPTER II.

In the natural system of botany, plants are classified—that is (in the language of Dr. Gray), "are marshalled under their respective classes, orders, tribes, genera, and species; and they are characterized—that is, their principal characteristics or distinguishing marks are described or enumerated, in order that—1st. Their resemblances or differences, of various degrees may be clearly exhibited, and all the species and kinds ranked next to those they are most related to; and 2ndly. That students may readily ascertain the botanical names of the plants they meet

with, and learn their peculiarities, properties, and place in the system."

In the following pages, I have given the 67 genera and 240 species (and upwards) which comprise the Order Graminæ. Although omitting as unnecessary (in this work), the tribes and sub-tribes, or grand divisions of the order, yet each genus, numbered and ranked (as stated above), next to those they are most related to, occupy their respective places throughout the order.

To the reader not acquainted with botany, this explanation is necessary, as showing the object or purpose in view.

As stated in the preceding chapter, the parts of fructification, the flower and the seed, are the least liable to vary from any change of soil or cultivation, and botanists have chosen them, on that account, to fix their generic distinction ; or when the flowers and seeds of any number of grasses agree, in one or two particular points, and differ therein from all the rest, such are termed a genus or family.

The generic name, or that of the genus, is one word, and a substantive, and is like the family name or surname of a person, as Smith or Brown ; that of the species answering to the Christian or baptismal name, as James or Joseph. In giving the scientific names, the first word that occurs in parenthesis is the name of the genus, the second that of the species ; as, for instance, in the White Clover (Trifolium Re; pens). Trifolium is the generic name, meaning three-leaved, and Repens the specific, meaning creeping—commonly called white clover. A genus often contains many species.

The botanical names of plants are all in Latin, or are Latinized, this being the common language of science everywhere. A little reflection will soon convince an unprejudiced person of the wisdom of this long-established practice. For example, Kentucky blue grass has quite a number of aliases in different parts of the country; but from St. Petersburgh in Europe to Kentucky in America, it is known to botanists as Poa Pratensis. There are hundreds of other similar cases that might be adduced, but the above may be considered sufficient.

In botanical nomenclature, or the language used in describing the various organs or parts of plants—such as their leaves, stems, flowers, seeds, etc.—terms are used which cannot easily be avoided, but which an ordinary English scholar, with a reasonable amount of perseverance, may soon become acquainted with.

The generic or family character is a description of what essentially distinguishes the genus; the specific character a brief enumeration of the points in which each species differs from others of the same genus.

In describing a plant, we first consider the root; then the stem, the leaves, the fulcra or supports, the different parts which constitute the flower, and (in a plant of grass) the seed. I will introduce and try to explain a few of the terms which are used in describing each of the above-mentioned parts in the generic and specific characters given in this work. And first, in describing the roots, the terms usually employed are—

FIBROUS. That is, consisting of many small fibres or threads, by which they draw their nourishment from the earth.

CREEPING. Larger than fibrous, and extending more (horizontally) in the soil.

BULBOUS. Consisting of knobs, not of one uniform texture, but composed of several concentric coats or layers, such as the onion or tulip.

The stem of grasses is called culm, straw, or stem.

Leaves or foliage are so called.

Nerve: a name for the ribs or veins of leaves, when simple or parallel.

LIGULE. The little membranous appendage at the summit of the leaf—sheaths of most grass (a fulcra).

The inflorescence or arrangement of flowers on the stem of grasses are in spikelets; a spikelet contains a number of diminutive flowers called florets; a flower consists of several distinct organs, most commonly of the calyx cup, or outer green scale of the spikelet; each leaf of the calyx is called a sepal, a glume, a bract, a palæ, a husk, or chaff—they are the leaves of the blossom, and serve to protect, support, and nourish the parts within; they are removed, if possible, in cleaning the seed, as in oats, etc. The corolla, or inner circle of delicate leaves, called petals (these are commonly known as the leaves of the flower). The stamens, consisting of two parts—the filament or stalk, and the anther. The latter is the most important part; it is a case or bag filled with fertilizing dust, called pollen. The pistil is the column in the centre of the flower, consisting of three parts, the german or ovary, which is

the base of the whole, and afterwards becomes the bearer of the seed; the style, which is the slender thread proceeding upwards from the ovary; and on the top of this is seated the stigma. This last receives the pollen, which, descending through the style, reaches and fertilizes the ovules, which become seeds, by having an embryo or rudimentary plantlet formed in them.

The above are the principal parts which belong to any flower. There, are however, many terms used in botany, which only a glossary or dictionary of terms used in describing plants, can furnish.

CHAPTER III.

NATURAL ORDER GRAMINEÆ (GRASS FAMILY).

1. LEERSIA,—Solander. WHITE GRASS.

GENERIC CHARACTER.

Flowers crowded in one sided panicled spikes or racemes, perfect, but those in the open panicles usually sterile by the abortion of the ovary, those enclosed in the sheaths of the leaves close fertilized in the bud and prolific. Spikelets, 1 flowered, flat, more or less imbricated over each other, jointed with the short pedicils. Glumes wanting, palets texture of paper, or parchment, strongly flattened laterally or folded upon themselves lengthwise, awnless, bristry ciliate on the keels, closed, nearly equal in length, but the lower much broader, enclosing the flat grain. Stamens 1 to 6, stigmas feathery, the hairs branching. Perennial marsh grasses; the flat leaves, sheaths, &c., rough upwards, being clothed with very minute hooked prickles.

(Named from Leers, a German botanist.)

1. LEERSIA, *Virginica* (White Grass), Virginia Cut Grass. Grows in wet woods; flowers in August and September; of no agricultural value.

2. LEERSIA, *Oryzoides*, (Rice Cut Grass, False Rice, White Grass.) Very wet places; common, flowers in August; possesses no agricultural value.

3. LEERSIA, *Lenticularis*, (Fly Catch Grass.) Low grounds, Virginia, Illinois and southward; perennial; flowers in July; no value.

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2. ZIZANIA—Gronovis. WATER OR INDIAN RICE.

GENERIC CHARACTER.

Flowers monæcious; the staminate and pistillate both in 1 flowered spikelets, in the same panicle. Glumes wanting, or rudimentary and forming a little cup. Palets herbaceo, membranaceous, convex, awnless in the sterile, the lower one tipped with a straight awn on the fertile spikelets; stamens 6; stigmas pencil form—large, often reed-like, water grasses; spikelets jointed, with the club-shaped pedicils, very decidous.

(Adopted from Zizanion, the ancient name of some wild grain).

1. ZIZANIA, *Aquatica* (Indian Rice, Water Oats). This grass grows wild in the Southern States, also in the Northwestern; seeds used for food for Indians. Common in swampy borders of streams and in shallow waters; flowers in August.

2. ZIZANIA, *Miliacea* (Prolific Rice). Found in Ohio and South, and grows from six to ten feet high in shallow water; flowers in August.

3. ALOPECURUS—Linnæus. Foxtail Grass.

GENERIC CHARACTER.

Spikelets 1-flowered; glumes boat-shaped, strongly compressed and keeled, nearly equal, united at the base, equalling or exceeding the lower palet, which is awned at the back, below the middle; upper palet wanting; stamens 3; styles mostly united; stigmas long and feathered; clusters contracted into a cylindrical and soft, dense spike; root perennial.

(Name from two Greek words, signifying fox and tail, the popular appellation, from the shape of spike.)

1. Alopecurus Pratensis, *Linnæus* (Meadow Foxtail). See page 35.

2. Alopecurus Geniculatus, *Linnæus* (Floating Foxtail.

SPECIFIC CHARACTER.

Culm ascending, bent at the lower joints; palet rather shorter than the obtuse glumes, the awn from near its base, and projecting half its length beyond it; anthers linear; the upper leaf as long as its sheath. Moist meadows eastward; flowers in May and June.

This grass grows in situations so liable to inundation, that the other good grasses, if sown there, are soon expelled. In respect to the degree of moisture which it will support, it stands between the rough-stalked poa and the flote fescue, and thus forms a connecting link between the fens and moister meadow lands in England, for it is found in some of the rich-

est marshes, and is much esteemed for its fattening qualities in pasture as well as for hay. It is a creeping plant, which flowers in May and June, and grows from the centre in a nearly horizontal position, the lower joints touching the ground, and it may be propagated by slips. Its seeds are difficult to procure, owing to the small number of culms or seed stalks which it produces, and the remarkable irregularity of their opening.

3. ALOPECURUS AGRESTIS (Slender Foxtail).

Observation.—Kneed or jointed-like in the middle; root fibrous, of biennial duration; flowers in July and August.

This grass is generally termed an annual, but it will flower and last two seasons on a light, dry soil. It is of comparatively little little importance, but may be sown along with some others, on light, sandy soils on the sea coast, where it will grow much better than any of the common rye grasses.

4. ALOPECURUS ARISTULATUS (the Wild Water Fox Tail). Grows in water and wet places of no agricultural value; flowers in June and August.

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4. PHLEUM—Linæus. CATSTAIL GRASS.

GENERIC CHARACTER.

Palets both present, shorter than the mucronate or awned glumes; the lower are truncate, usually awnless; styles distinct, otherwise much as in Alopecurus; perennials; spike very dense, harsh.

(An ancient Greek name.)

1. PHLEUM PRATENSE, *Linnæus* (Timothy Catstail). See page 19.

2. PHLEUM ALPINUM, *Linnæus* (Mountain Catstail). Alpine tops of the White Mountains, New Hampshire, and high northward.

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5. CRYPSIS—Aiton. CRYPSIS.

GENERIC CHARACTER.

Spikelets 1-flowered, in clusters which are crowded in a dense head or short spike, bracted by the uppermost leaves; glumes, palets, etc., as in the next genus, or rather thinner. Low and spreading-tufted annuals, natives of the East, with short leaves; the sheaths of the upper spathaceous.

(A Greek name, "concealment.")

The spikes, at first, are partly hidden by the subtending sheaths.

1. CRYPSIS SCHOENOIDES, *Lam.* Waste places, streets of Philadelphia and vicinity; also Wilmington (Delaware) common.

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6. VILFA—Adanson, Pd' Beauvois. RUSH GRASS.

GENERIC CHARACTER.

Spikelets 1-flowered, in a contracted or spiked panicle; glumes 1-nerved or nerveless, not awned or pointed, the lower smaller; flower nearly sessile in the glumes; palets 2, much alike, of the same texture as the glumes (membranace chartaceous), and usually

longer than they, naked, awnless and mostly pointless; the lower 1-nerved (rarely somewhat 3-nerved). Stamens chiefly 3. Stigmas simply feathery; grain (caryopsis oblong or cylindrical, deciduous; culms wiry or rigid; leaves inviolate, usually bearded at the throat, their sheaths often enclosing the panicles.

(Name unexplained.)

1. VILFA ASPERA (Rough-Leaved Vilfa, Rush Grass). Flowers in September; of no agricultural value.

2. VILFA VAGINÆFLORA (Hidden-Flowered Vilfa). Common on barren, sandy soils, from Maine to Illinois; no value.

3. VILFA CUSPIDATA, *Torr.* Borders of Maine, on St. John's river, etc.

4. VILFA VIRGINICA, *Beauv.* Sandy sea shore, Virginia and Southern States.

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7. SPOROBOLUS—Robt. Brown. DROP SEED GRASS.

GENERIC CHARACTER.

Spikelets 1 (rarely 2), flowered in a contracted or open panicle; flowers nearly as in Vilfa; the palets longer than the unequal glumes; stamens 2 to 3; grain a globular auticle (hyaline or rarely coriaceous), containing a loose seed, decidous.

(Whence the name from two Greek words, meaning seed and to cast forth.

1. S. JUNCEUS (Rush-like drop seed). Prairies, Wisconsin and the South. Flowers in August.

2. S. HETEROLEPIS, *Gray* (Strong-scented Vilfa). This plant emits a strong odor. Middle and Western States to Illinois; flowers in August.

3. S. CRYPTANDIUS, *Gray* (Large Panicled Vilfa). Panicle lead-colored; sandy shores, coast of New England and of the Great Lakes; flowers in August and September.

4. S. COMPRESSUS (Close-flowered drop seed); of no value for agricultural purposes.

5. S. SEROTINUS, *Gray* (Late Drop Seed). It is a delicate grass, of no agricultural value; flowers in September.

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8. AGROSTIS, Linn. BENT GRASS.

GENERIC CHARACTER.

Spikelets 1-flowered, in an open panicle; glumes somewhat equal, or the lower rather longer, usually longer than the palets, pointless; palets very thin, pointless, naked; the lower 3 to 5-nerved, frequently awned on the back; the upper often minute, or none. stamens, chiefly three; grain (caryopsis) free; culms usually tufted, slender; root commonly perennial.

(Name from agros, a field, the place of growth.)

1. A. ELATA (Taller Thin Grass). Grows from two to three feet high, in swamps, from New Jersey southward.

2. A. PERENNANS (Thin Grass. Damp, shaded places.

3. A. SCABRA (Hair Grass or Fly-Away Grass, Tickle Grass. Common in old fields and marshy places; no value.

4. A. CANINA (Brown or Dogs' Bent Grass).

SPECIFIC CHARACTER.

Culms eight inches to two feet high; roots, leaves, involute bristle form, those of the culm flat and broader; panicle loose; ; glumes slightly unequal, ovate-lanceolate, very acute; palet exsertly awned on the back, at or below the middle; spikelets brownish or purplish, rarely pale or greenish (one-twelfth to nearly one-sixth inch long).

Remarks.—Perennial: flowers in June and July. grows naturally in poor, wet, peaty soils, and is only valuable for cultivating on such. Cattle seem to prefer this to most others of the genus.

5. A. VULGARIS (Fine Bent Grass, Red Top). See page 64.

6. A. ALBA (White Bent Grass).

SPECIFIC CHARACTER.

Panicle spreading, meagre, branches roughish; culms decumbent; root creeping.

This grass is late, unproductive, and contains but little nutritive matter. Its creeping roots greatly exhaust the soil. In this variety they are smaller than in the other varieties, but equally difficult to

extirpate, when once in possession of tenacious clays.

This plant does not produce stolones or runners, like the varieties of the Agrostis Stolonifera; sometimes, indeed; a few slender runners are found, but they seldom strike out at the joints. The creeping roots abundantly supply this defect in the plant for its propagation, as they creep under the surface, and send up at intervals numerous young shoots. This property of the roots is the best character of distinction for the purpose of the agriculturist, as it may be found at any season or stage of growth of the plant. Flowers early in August, and seeds are ripe in beginning of September.

7. A. STOLONIFERA (Creeping Bent Grass or Fiorin). See page 67.

8. A. DISPAR (The Southern Bent) This is a useful grass. It is similar in appearance to some of the broad-leaved varieties of red top. It has stronger and more numerous creeping roots, broader leaves, and more upright leafy stems. It is met with in the Southern States, but is not cultivated in the Northern States that I am aware of. When once rooted it is almost as bad as Triticum Repens to extirpate. It has been tried and discarded in England.

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9. POLYPOGON—Desfontains. BEARD GRASS.

GENERIC CHARACTER.

Spikelets 1-flowered, in a contracted, mostly spike-like panicle; glumes nearly equal, long-awned, much

longer than the membranaceous palets, the lower or which is commonly short-awned below the apex; stamens 3 ; grain free).

(Name from two Greek words, much and beard, from the awns.)

1. P. Monspeliensis (Annual Beard Grass). It is found at the Isle of Shoals and on the coast southward. No agricultural value.

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10. CINNA—Linn. Wood Reed Grass.

GENERIC CHARACTER.

Spikelets 1-flowered, much flattened, crowded in an open, flaccid panicle; glumes lenceolate, acute, strongly keeled, rough-serrulate on the keel, the lower rather smaller, the upper a little exceeding the palets; flower manifestly stalked in the glumes, smooth and naked ; the palets much like the glumes, the lower longer than the upper; short-awned or mucronate on the back below the pointless apex; stamen one, opposite the 1-nerved upper palet; grain linear, oblong, free. A perennial, rather sweet-scented grass, with simple and upright, somewhat reed-like culms (2 to 7 feet high), bearing an ample compound terminal panicle, its branches in fours or fives; the broadly linear lanceolate flat leaves one-third to one-half inch wide) with conspicuous ligules ; spikelets green, often purplish tinged.

Name unexplained.

1. C. Arundinacea—L. (Wood Reed Grass, Indian Reed Cinna). This is a large, rank grass, growing

in moist roads and shaded swamps, rather common; flower monandrous. Of no special agricultural value.

2. C. Pendula, *Gray* (Drooping Red Grass). Grows in moist woods; perennial, flowering in August.

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11. MUHLENBERGIA—Schreber. Drop Seed Grass.

GENERIC CHARACTER.

Spikelets 1-flowered, in contracted, or rarely in open panicles; glumes mostly acute or bristle-pointed, persistent, the lower rather smaller or minute; flower very short-stalked or sessile in the glumes; the palets usually minutely bearded at the base, herbaceaus, deciduous with the enclosed grain, often equal, the lower 3-neved, mucronate, or awned at the apex; stamens 3.

Dedicated to the Rev. Dr. Henry Muhlenberg, a distinguished American botanist of the early part of this century.

1. M. Sobolifera (Awnless Muhlenbergia). Open, rocky woods, from Massachusetts and Michigan, Illinois, and southward. Flowers in August.

2. M. Glomerata (Clustering Muhlenbergia). Common in swamps, low grounds, bogs, etc. Flowers in August and September.

3. M. Mexicana (Mexican Muhlenbergia). Resembles fowl meadow grass. Regarded as a troublesome weed. Common in low grounds. Flowers in August and September.

4. M. Sylvatica (The Sylvan Muhlenbergia). Is common in low or rocky woods. Flowers in August and September.

5. M. Wildenovii (Wildenow's Muhlenbergia). Found in rocky woods, growing about three feet high. Flowers in August.

6. M. Diffusa (Drop Seed Nimblewill). Is common at the West, Kentucky, Tennessee, and southward. Cattle eat it very readily. Perennial. Flowers in August and September.

7. M. Capillaris (Hair Grass). Is found on sandy soils, New England to New Jersey, Kentucky and southward. Flowers in September.

None of the grasses of this American genus are of much agricultural value, except as they add to the verdure of the land.

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11. BRACHYELYTRUM—Beauv. BRACHYELYTRUM.

GENERIC CHARACTER.

Spikelets 1-flowered, with a conspicuous filiform pedicil of an abortive second flower about half its length, nearly terete, few, in a simple appressed race-

med panicle; glumes unequal, persistent, usually minute, or the lower one almost obsolete; palets chartaceo-herbaceous, involute, enclosing the linear oblong grain, somewhat equal, rough, with scattered, short bristles; the lower 5-nerved, extended into a long, straight awn; the upper 2-pointed; the awn like sterile pedicil, partly lodged in the groove on its back; stamens 2; anthers and stigmas very long. Perennial, with simple culms, 1 to 3 feet high, from creeping rootstocks, downy sheaths, broad and flat lanceolate-pointed leaves, and spikelets one-half inch long, without the awn.

Name from two Greek words, short and husk, from the minute glumes.

1. B. Aristatum (The Erect Muhlenbergia or Awned Brachyelytrum). Found in rocky woods on the sides of Wachuset mountain, and other similar situations. Flowers in June and July.

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13. CALAMAGROSTIS—Adans. Reed Bent Grass.

GENERIC CHARACTER.

Spikelets 1-flowered, and often with a pedicil or rudiments of a second abortive flower (rarely 2-flowered), in an open or spiked panicle; glumes keeled or boat-shaped, often acute; commonly nearly equal, and exceeding the flower, which bears at the base copious, white, bristly hairs; palets thin, the lower bearing a slender awn on the back or below the tip, or sometimes awnless, the upper mostly shorter; stamens 3; grain free. Perennials, with running

root-stocks, and mostly tall and simple rigid culms.

Name compounded of the Greek words *kalamos*, a reed, and *agrostis*, a grass.

1. C. Canadensis (Blue Joint Grass). Wet grounds). Common northward. Flowers in July. A useful grass.

2. C. Langsdorffii. Found on White mountains, New Hampshire, and northward.

3. C. Stricta. Ledges at Willoughby lake, Vermont, and northward.

4. C. Confinis or Inexpansa, *Gray*. N. and W. New York (especially Penn Yan), and Pennsylvania. Flowers in July.

5. C. Nuttaliana or Coaractata (Crowded Calamagrostis). Moist grounds, E. New England to Pennsylvania, Virginia, and southward. Flowers in August.

6. C. Porteri, *Gray*. Found in dry woods, Pulpit Rocks and vicinity, Huntington county, Pennsylvania.

7. C. Pickeringii, *Gray*. Found near Summit of White monntains, New Hampshire.

8. C. Brevipilis (Purple Bent). Swamps and pine barrens in New Jersey. Rare. Flowers in September.

9. C. Longifolia (Woolly Bent). Sheaths clothed with decidious wool. Sands along the upper Great

Lakes, from Illinois and Michigan northwestward. Flowers in August.

10. CALAMAGROTIS, *Arenaria* (Beach Grass, Sea Sand, Reed, Mat Grass).

SPECIFIC CHARACTER.

Culm Stout and rigid (2 to 3 ft. high) from firm running rootstocks; panicle contracted into a dense cylindrical spike (5 to 9 in. long); hairs only one third of the length of the palet.

This well known grass is found on sandy beaches, from New Jersey to Maine and northward on the Great Lakes. Its thick, strong, creeping, perennial roots, with many tubers the size of a pea, prevent the drifting of the sand from the action of the winds and waves, thus forming a barrier against the encroachment of the ocean. This seems to be the chief utility of the plant as it serves this purpose the world over.

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14. ORYZOPSIS — Mich. MOUNTAIN RICE.

GENERIC CHARACTER.

Spikelets 1-flowered, nearly terete. Glumes herbaceous or thin membranaceous; several nerved; nearly equal; commonly, rather longer than the oblong flowers, which is deciduous at maturity, and with a very short, obtuse, callus or scar-like base. Lower palet coriaceous, at length involute so as closely to enclose the upper (of the same length) and the oblong grain. A simple, untwisted and deciduous awn, jointed on its apex. Stamens 3; Squamulæ 2

or 3, conspicuous; Stigmas plumose. Perennials, with rigid leaves, and a narrow raceme or panicle. Spikelets greenish, rather large. (Name composed of two Greek words *orysa*, rice, and *opsis*, likeness, from a fancied resemblance to that grain.)

1. O. *Melanocarpa*, (Black Mountain Rice), is a common grass in dry, rocky woods, with a leafy stem from two to three feet high; husks of the seed blackish when ripe; flowers in August.

2. O. *Asperifolia* (White Mountain Rice). Steep rocky hill sides, and in dry woods; grows from a foot to eighteen inches high; seeds farinaceous, and make a fine and white flower but difficult in procuring, as the grain drops so easily. Flowers in May.

3. O. *Canadensis* (Smallest, or Canadian Rice) Rocky hills and dry plains; rare; flowers in May.

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15. STIPA, Linn. Feather Grass.

GENERIC CHARACTER.

Spikelets 1-flowered; terete; the flower falling away at maturity (with the conspicuous obconical, bearded, and often sharp-pointed callus) from the membranaceous glums. Lower palet coriaceous, involute, and closely embracing the smaller upper one, and the cylindrical grain, having a long and twisted or tortuous simple awn jointed with its apex. Stamens mostly 3; stigmas plumose; perennials, with narrow, involute leaves, and a loose panicle. (Name, a Greek word *stype*, tow, in allusion to the

flaxen appearance of the feathery awns of the original species. In our species the awn is naked). Gray.

1. S. *Richardsonii*) Richardson's Feather; no agricultural value.

2. S. *Avenacea* (Black Oat Grass) is one of the prairie grasses of Michigan, Illinois, Wisconsin, &c. Flowers in July.

3. S. *Spartea* (Porcupine Grass) this is another prairie grass.

4. S. *Pennata* (Feather Grass) one of the most beautiful of the Genus Perennial. An ornamental grass in gardens.

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16. ARISTIDA, Linn. Triple Awned Grass.

GENERIC CHARACTER.

Glumes unequal, often bristle pointed. Lower palet, tipped with three awns, the upper much smaller; otherwise much as in stipa. Culms branching; leaves narrow, often involute. Spikelets in simple or panicled racems or spikes. Grain linear. (Name from arista, a beard or awn). All grow in sterile, dry soil, and all ours have the awns naked and persistent, and flowers late. Gray.

1. A. *Ramossissima* (Three Awned Grass). Found on dry prairies of Illinois and in Kentucky.

2. A. *Dichotoma* (Poverty Grass) Dry, sandy or gravelly fields; common, especially southward.

3. A. *Gracilis* (Slender Three Awned Grass). Seldom found except on the poorest land; of no value for cultivation.

4. A. *Stricta* (Downy Triple Awn), not cultivated.

5. A. *Oligantha*, Mich. (Prairie Triple Awn). Found by Michaux on the prairies of Illinois, also found in Virginia and Southwestward.

6. A. *Parpurascens* (Purple Triple Awn), common from Massachusettes to Illinois and Southward. Not cultivated.

7. A. *Lanata.* Found in Maryland and Southward.

8. A. *Tuberculosa*, (Long Awned Poverty Grass). Sandy soil, East Massachusetts to New Jersey, also Wisconsin, Illinois and Southward.

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17. SPARTINA, Schreber. Cord or Marsh Grass.

GENERIC CHARACTER.

Spikelets 1-flowered, without a rudiment, very much flattened latterally; spiked in 2 ranks on the outer side of a triangular rhachis; glumes strongly compressed; keeled, acute, or bristle pointed, mostly rough-bristly on the keel; the upper one much larger, and exceeding the pointless and awn-

less palets, of which the upper is longest. Squamulæ none; stamens 3; styles long, more or less united; perennials with simple and rigid reed-like culms, from extensively creeping, scaly rootstocks, racemed spikes; very smooth sheaths, and long and tough leaves, (whence the name, from the Greek word, *spartine*, a cord, such as was made from the bark of the Spartium or Broom).

1. S. *Cynosuroides* (Fresh Water Cord Grass, or Tall Marsh Grass). Found on banks of rivers and lakes, especially Northward, also in Western States. Flowers in August.

2. S. *Polystachya* (The Salt Reed Grass). Salt or brackish marshes, within tide water, especially Southward.

3. S. *Juncea* (Rush Salt Grasss). Salt marshes and sea beaches.

4. S. *Stricta* (Salt Marsh Grass). Salt marshes. Pennsylvania and South. Odor strong and rancid.

5. S. *Glabra* (Rough Marsh Grass), a variety of the last; common on the coast of New England, Southward.

6. S. *Atterniflora* (Smooth Marsh Grass. This grass has a strong and rancid odor, and is common with the last. Spartina Atterniflora and S. Polystachya, are worthy the special attention of students, as they are supposed to be varieties of what was commonly known in Europe many years ago, as the American cocksfoot. (Dactylis Cynosurides.)

18. CTENIUM, Ranzer. Toothache Grass.

GENERIC CHARACTER.

Spikelets densely imbricated in two rows on one side of the flat curved rhachis of the solitary terminal spike. Glumes persistent; the lower one (interior) much smaller; the other concave below, bearing a stout, recurved awn, like a horn, on the middle of the back.

Flowers 4 to 6, all but one neutral; the one or two lower consisting of empty awned palets; the one or two uppermost of empty awnless palets; the perfect flower intermediate in position; its palets membranaceous, the lower awned or mucronate below the apex, and densely ciliate towards the base, 3 nerved. Squamulæ 2. Stamens 3. Stigmas plumose.

Name Greek—*ktenion* a small comb—from the pectinate appearance of the spike.

1. C. Americanum (Tooth-ache grass). Stem 3 to 4 feet high, from a perennial root. It is found in the wet pine barrens of New Jersey. Taste very pungent. No agricultural value.

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19. BOUTELOUA—Legasca. Muskit Grass.

GENERIC CHARACTER.

Spikelets crowded and closely sessile in two rows on one side of a flattened rhachis, comprising one perfect flower below, and one or more sterile (mostly

neutral) or rudimentary flowers. Glumes convex keeled, the lower ones shorter. Perfect flower, with the 3-nerved lower palet 3-toothed or cleft at the apex, the 2-nerved upper palet 2-toothed; the teeth, at least of the forme, pointed or subulate awned; Stamens 3; anthers orange-colored or red. Rudimentary flowers mostly 1 to 3 awned. Spikes solitary, racemed or spiked; the rhachis somewhat extended beyond the spikelets.

Named for Claudius Boutelou, a spanish writer on floriculture and agriculture.

1. B. Oligostachya (Muskit or Mosquit Grass). Westward. This grass is very nutritious. On the plains and slopes of the Rocky mountains, it cures in the late summer into a natural hay, and is much valued.

2. B. Hirsuta (Bristly Murkit). Grows in tufts. Sandy plains Wisconsin, Illinois, and southward.

3. B. Curtipendula (Hairy Muskit). This grass is cultivated in many parts of the Southern States. Flowers from July to September.

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20. GYMNOPOGON—Beauv. Naked Beard Grass.

GENERIC CHARACTER.

Spikelets of one perfect flower, and the rudiment of a second (consisting of an awn-like pedicil mostly bearing a naked bristle), sessile and remotely alternate on long or filiform rays or spikes, which form a

crowded, naked raceme. Glumes lance awl-shaped, keeled, almost equal, rather longer than the somewhat equal membranaceous palets, of which the lower is cylindrical-involute, with the midrib produced from just below the 2-cleft apex into a straight and slender, bristle-like awn ; the upper with the abortive rudiments at its base. Stamens 3. Stigmas pencil form, purple. Root perennial. Leaves short and flat, thickish, 1 to 3 inches long.

Name from of two Greek words—*gymnos* naked, and *pogon* beard—alluding to the reduction of the abortive flower to a bare awn.

1. G. Racemosus (Naked Beard Grass). Pine barrens of New Jersey to Virginia and southward. Flowers in August and September.

2. G. Trefolius (Short-leaved beard Grass). Sussex county, Delaware, and southward.

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21. CYNODON—Richard. Bermuda or Scutch Grass.

GENERIC CHARACTER.

Spikelets 1-flowered, with a mere naked, short, pedicilled rudiment of a second flower, imbricate spiked on one side of a flattish rhachis ; the spikes usually digitate at the naked summit of the flowering culms. Glumes keeled, pointless, rather unequal. Palets pointless and awnless; the lower larger, boat-shaped. Stamens 3. Low, diffusely-branched, and extensively-creeping perennials, with short, flattish leaves.

Name derived from the Greek—*kynos* a dog, and *odontos* a tooth.

1. Cynodon Dactylon (Bermuda Grass, Scutch Grass.

SPECIFIC CHARACTER.

Spikes four or five, crowded together, corolla smooth.

Smith's Eng. Flora.

Observations.—The roots are tough and creeping, almost woody, with smooth files; stems also creeping to a great extent, matted, round, jointed, leafy, very smooth; leaves tapering, sharp-pointed, ribbed, hairy, a little glaucous, with long, striated, smooth sheaths, and a hairy stipulæ; spikes four or five, linear, flowers purplish, shining, ranged in two close, alternate rows; the corolla is longer than the calyx, very much compressed, opposite.

This celebrated East India grass was first brought to notice by the experiments made with it in the experimental grass garden at Woburn Abbey, the seeds being forwarded from India, by the Marquis of Hastings for that purpose.

The experiments made with this and the English species (Panicum Dactylon) showed that the India species flowered freely every season, whereas the native English plants flowered very seldom.

It has not received much attention from English agriculturists since its introduction, as it scarcely begins to vegetate in the climate of England till the month of June, and its produce and nutritive powers are inferior to other favorite grasses.

In the East Indies the doob grass, as it is there called, grows luxuriantly, and is highly valued as food for horses, etc. It flowers in September, and the seed is ripe about the end of October, and sometimes in November. The plants, natives of the English coast, flower about a month earlier than the above.

This plant has long been naturalized in the Southern States, and there are few grasses growing in the South that so much has been said and written about than the grass.

Elliott described it as a tender, delicate grass, growing over and binding the most arid and loose lands in the country, and apparently preferred by stock of all descriptions to every other grass in the Southern States.

L. H. Girardin, of Baltimore College (1824), said of it: The excellence of this plant for pasturage is evidenced by two circumstances. It is preferred by stock of every description (South) to all other grasses, and it grows luxuriantly in every kind of soil. It possesses an additional advantage—that of binding the loosest and most barren sandy tracts, but when it has once taken possession of close, rich soil, its extirpation is so difficult as almost to defy all the skill, industry, and perseverance of farmers.

T. Affleck, of Brentham, Texas, who has given more attention to the history and cultivation of this grass than, perhaps, any other man in the country, says of it:

"I made my first working acquaintance with this grass in 1842. From the first, I was satisfied of its immense value to the South as a hay and pasture grass. At the same time, it was evidently a dreadful

pest in the crops, which fact was so earnestly impressed upon me by every experienced planter with whom the subject was discussed, that great caution was naturally induced in the spreading of it myself, or being the means of persuading others to do so. After a season or two, however, of experience in the extraordinary yield of hay, and the number of animals subsisted per acre, and possessed of a more thorough knowledge of the washed and worn condition of the greater part of the hill plantations through the interior of Adams county, Mississippi, where I then resided, I strongly urged the planting of these fields with this grass. The owner of a hill plantation now under thorough hedge, and with a close sod of Bermuda grass over his fields, can easily make a living by grazing stock of any kind, independent of free labor. And if the owner and occupant of a river place in like condition, he has a sure means of even wealth in the hay such a place will yield."

Mr. W. Phillips, Memphis, Tenn., writing to *Country Gentleman* in 1872, says:

"If Bermuda grass be not (for summer) the best grass ever grown—latitude 34° and below—I ask to see. I say, take land equal in fertility or poverty, and New York, can produce no grass that will feed as many cattle, or horses, or mules, or sheep as Bermuda grass will in Louisiana, Missisippi, Alabama, Georgia, or Florida. This grass is propagated by planting very small pieces of sod or scraps of roots, in squares of, say four feet. The weeds, etc., must be kept down for one season, after which it will take care of itself."

22. DACTYLOCTENIUM—Wild. Egyptian Grass.

GENERIC CHARACTER.

Spikelets several-flowered, with the uppermost flower imperfect, crowded on one side of a flatened rhachis, forming dense pectinate spikes, 2 to 5 in number, digitate at the summit of the culm. Glumes compressed laterally and keeled, membranaceous, the upper (exterior) one awn-pointed. Lower palet strongly keeled and boat-shaped, pointed. Stamens 3. Pericarp a thin utricle, containing a loose globular and rough-wrinkled seed. Root annual. Culms diffuse, often creeping at the base.

Name compounded of *daktylos*, finger, and *ktenion*, a little comb, alluding to the digitate and pectinate spikes.

1. D. Egyptiacum (Egyptian Grass). A troublesome weed.

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23. ELEUSINE — Gærtn. Crab Grass, Yard Grass.

GENERIC CHARACTER.

Spikelets 2 to 6 flowered, with a terminal naked rudiment, closely imbricate-spiked on one side of a flattish rhachis; the spikes digitate. Glumes membranaceous, pointless, shorter than the flowers. Palets awnless and pointless; the lower ovate, keeled, larger than the upper. Stamens 3. Pericarp (utricle)

containing a loose, oval, and wrinkled seed. Low annuals, with flat leaves, and flowers much as in Poa.

Name from *Eleusin*, the town where Ceres, the goddess of harvests, was worshipped.

1. E. Indica (Crab Grass, Wire Grass, Crowsfoot). A useful grass in Mississippi, Alabama, and adjoining States; growing luxuriantly, and is plowed down as a fertilizer—also serving as a hay and for pasturage.

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24. LEPTOCHLOA—Beauv. Oxydenia, Slender Grass.

GENERIC CHARACTER.

Spikelets 3—many-flowered (the uppermost flower imperfect), loosely spiked on one side of a long filiform rhachis; the spikes racemed. Glumes membranaceous, keeled, and often awl-pointed, the upper one somewhat larger. Lower palet 3-nerved, with the lateral nerves next the ciliate or hairy margins awnless, or bristle-awned at the entire or 2-toothed tip, larger than the upper. Stamens 2 or 3. Seed sometimes loose in the pericarp. Ours annuals. Leaves flat.

Name composed of *leptos*, slender, and *chloa*, grass, from the long, attenuated spikes.

Gray.

1. L. Mucronata (Pointed Slender Grass). Found in fields from Virginia to Illinois and southward. An

annual, growing from two to three feet high. Flowers in August.

2. L. Fascicularis, *Gray* (Clustering Slender Grass). Brackish meadows from Rhode Island southward, along the coast, and from Illinois southward, on the Mississippi. Flowers in August.

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25. TRICUSPIS—Beauv.

GENERIC CHARACTER.

Spikelets 3 to 12-flowered, somewhat terete; the terminal flower abortive. Glumes unequal. Rhachis of the spikelet bearded below each flower. Palets membranaceous or somewhat chartaceous; the lower much larger than the 2-toothed upper one, convex, 2 to 3-toothed or cleft at the apex, conspicuously hairy-bearded or villous on the 3 strong nerves, of which the lateral are marginal or nearly so and usually excurrent, as is the mid nerve especially, into a short cusp or awn. Stamens 3. Stigmas dark purple, plumose. Grain oblong, nearly gibbous. Leaves taper-pointed; sheaths bearded at the throat. Panicle simple or compound; the spikelets often racemose, purplish

Name from the Latin *tricuspis*, three-pointed, alluding to the lower palet.

1. T. Seslerioides (Tall Red Top). A showy grass, growing from three to 5 feet high, on dry or sandy fields, from New York to Illinois, and southward. Flowers in August.

2. T. Purpurea, *Gray* (Sand Grass). Is found on same soils as the above, from 6 inches to a foot high. Acid to the taste. Flowers from August to September.

3. T. Cornuta (Horned Sand Grass). Another species found at the South. Of no agricultural value.

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26. GRAPHEPHORUM—Desv. Dupontia, R. Br.

GENERIC CHARACTER.

Spikelets 2 to 5-flowered, rather terete. Glumes membranaceous, mostly nearly equalling the remote flowers. A cluster of villous hairs at the base of each flower. Palets thin and membranaceous or scarious, the lower one convex, scarcely keeled, faintly nerved, entire, pointless, and awnless. Stamens 3. Stigmas plumose. Ovary glabrous. Perennial and northern or arctic grasses, with linear flat leaves, their sheaths closed at the base, the spikelets in a loose panicle.

Genus allied to the Avenæ, but awnless; named from *graphis*, a pencil, and *phero*, to bear, from the tufts of hair at the base of the flowers.

1. G. Melicoides, *Beauv.* Stem 1 to 2 feet high. Found at Grand Detour, Michigan, shore of Moosehead lake, Maine, and northward.

2. G. Major, *Gray* (Large G. Grass or Dupontia Grass). Grows 2 to 3 feet high. Found in Macomb county, Michigan.

27. DIARRHENA—Raf. Diarrhena.

GENERIC CHARACTER.

Spikelets several-flowered, smooth and shining, one one or two of the uppermost flowers sterile. Glumes ovate, much shorter than the flowors, coriaceous, the lower one much smaller. Lower palet ovate, convex on the back, rigidly coriaceous, its 3 nerves terminating in a strong and abrupt cuspidate or awl-shaped tip. Squamulæ ovate, ciliate. Stamens 2. Grain very large, obliquely ovoid, obtusely pointed, rather longer than the palets, the cartilaginous shining pericarp not adherent to the seed. A nearly smooth perennial, with running rootstocks, producing simple culms (2 to 3 feet high), with long, linear, lanceolate flat leaves towards the base, naked above, bearing a few short pedicelled spikelets (1-6 to 1-4 inch long) in a very simple panicle.

Name composed of *dis*, two, and *arren* man, from the two stamens.

1. D. Americana, *Beauv.* (Twin Grass). Shaded river banks and woods, Ohio to Illinois, and southward.

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28. DACTYLIS—Linæus. Orchard Grass.

GENERIC CHARACTER.

Spikelets several-flowered, crowded in one-sided clusters, forming a branching dense panicle. Glumes and lower palet herbaceous, keeled, awn-pointed,

rough ciliate on the keel, the 5 nerves of the latter converging into the awn-like point; the upper glume commonly smaller and thinner. Stamens 3. Grain lance oblong, acute, free. Perennials; leaves keeled.

Name from *daktylis*, a Greek word, signifying a finger's breadth, apparently in allusion to the size of the clusters.

1. D. Glomerata (Rough Cocksfoot, Orchard Grass). See page 24.

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29. KOELERIA, *Pers.* KOELERIA.

GENERIC CHARACTER.

Spikelets 3 to 7-flowered, crowded in a dense and narrow spike-like panicle,. Glumes and lower palet membranaceous, compressed-keeled, obscurely 3-nerved, barely acute, or the latter often mucronate or bristle-pointed; the former moderately unequal, nearly as long as the spikelet. Stamens 3. Grain free. Tufted grasses (allied to Dactylis and Poa), with simple upright culms; the sheaths often downy.

Named for Professor G. L. Kohler, an early writer on grasses.

1. K. Cristata (Crested Koeleria). Dry, gravelly places, Pennsylvania to Illinois, and westward. Variety gracilis, with a long and narrow spike, the flowers usually barely acute, Dry hills, Pennsylvania to Illinois; thence northward and westward.

30. EATONIA—Raf. Reboulea, Kunth.

GENERIC CHARACTER.

Spikelets usually 2-flowered, and with an abortive rudiment or pedicel, numerous, in contracted or slender panicle, very smooth. Glumes somewhat equal in length, but very dissimilar, a little shorter than the flowers; the lower narrowly linear, keeled, 1-nerved; the upper broadly obovate, folded round the flowers, 3-nerved on the back, not keeled, scarious-margined. Lower palet oblong, obtuse, compressed, boat-shaped, naked, charataceous; the upper very thin and hyaline. Stamens 3. Grain linear-oblong, not grooved. Perennial, slender grasses, with simple and tufted culms, and often sparsely downy sheaths, flat flower leaves, and small greenish (or rarely purplish) tinged spikelets.

Named for Professor Amos Eaton, author of a popular manual of the botany of the United States, which was for a long time the only general work available for students in this country, and of other popular treatises.

Gray.

1. E. Obtusata, *Gray.* Dry soil, Pennsylvania to Wisconsin, and southward: Flowers in June and July.

2. E. Pennsylvania (Pennsylvania Eatonia). Is a common grass in moist woods and meadows throughout the Northern States. Flowers in June and July.

31. MELICA—Linn. Melic Grass.

GENERIC CHARACTER.

Spikelets 2 to 5-flowered; the 1 to 3 upper flowers imperfect and dissimilar, convulate around each other, and enwrapped by the upper fertile flower. Glumes usually large, scarious-margined, convex, obtuse, the upper 7 to 9-nerved. Palets papery-membranaceous, dry and sometimes indurating with age; the lower rounded or flattish on the back, 7—many-nerved, scarious at the entire blunt summit. Stamens 3. Stigmas branched plumose. Perennials with soft and flat leaves. Panicles simple or sparingly branched; the rather large spikelets racemose-one-sided.

An old name, from *meli*, honey.

1. M. Mutica (Melic Grass). Of which there are several varieties, viz., M. Glabra, M. Diffusa. Rich soils southeastern Pennsylvania to Wisconsin, and southward.

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32. GLYCERIA—R. Br., Trin. Manna Grass.

GENERIC CHARACTER.

Lpikelets tirete or flattish, several—many-flowered; the flowers mostly early deciduous by the breaking up of the rhachis into joints, leaving the short and unequal 1 to 3-nerved membranaceous glumes behind. Palets naked, of a rather firm texture, nearly equal; the lower rounded on the back, scarious (and some-

times obscurely toothed) at the blunt or rarely acute summit, glabrous, 5 to 7-nerved, the nerves parallel and separate. Stamens 3 or in the first section commonly 2. Stigmas plumose, mostly compound. Ovary smooth. Grain oblong, free. Perennial, smooth marsh-grasses, mostly with creeping bases or root-stocks; the spikelets panicled.

Name from *glykeros*, sweet, in allusion to the taste of the grain.

1. G. Canadensis (Rattlesnake Grass). Bogs and wet places. Common from Pennsylvania, northward. Flowers in July.

2. G. Obtusa (The obtuse Spear Grass). An aquatic grass.

3. G. Elongata (Long Panicled Manna Grass). Wet woods and swamps, from New England to Michigan, and northward.

4. G. Nervata (Meadow Spear Grass, Nerved Manna Grass). Fowl meadow of many farmers in Eastern States. See page 70.

5. G. Pallida (The Pale Manna Grass). Grows mostly in shallow water. No value for cultivation.

6. G. Aquatic (The water Spear Grass, or Reed Meadow Grass. See page 72.

7. G. Fluitans (The Floating meadow Grass, or Common Manna Grass. See page 72.

8. Glyceria Acutifolia (Pointed Spear Grass). Resembles F. Fluitans, but with smaller leaves, and

flowers twice the length. Wet places, Pennsylvania to Maine. Rather rare.

9. G- Maratima (Goose Grass, Greeping Sea Meadow Grass, Sea Spear Grass). Grows naturally near the see, and is relished by stock of all kinds.

10. G. Distans (Clustered Spear or Reflexed Meadow Grass). Similar to goose grass, but of less value.

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33. BRIZOPYRUM—Link. Spike Grass.

GENERIC CHARACTER.

Spikelets and numerous flours compressed, crowded in a densely spiked or capitate panicle. Glumes herbaceous or membranaceaus; the lower faintly many-nerved. Lower palet rather coriaceous, laterally much flattened, indistinctly many-nerved, acute. Ovary stalked. Flowers dicœcious, pretty large. Leaves crowded on the culms, involute, commonly rigid.

Name compounded of *briza*, the quaking grass, and *pyros*, wheat.

1. B. Spicatum (Spike Grass). A salt marsh grass, with creeping rootstocks; stems from 10 to 18 inches high, in tufts. Flowers in August.

34. POA—Linn. Meadow Grass, Spear Grass.

GENERIC CHARACTER.

Spikelets ovate or lance ovate, laterally compressed, several (2 to 10-flowered), in an open panicle; glumes mostly shorter than the flowers, the lower smaller; lower palet membranaceo-herbaceous, with a delicate scarious margin, compressed-keeled, pointless, 5-nerved (the intermediate nerves more obscure or obsolete), the principle nerves commonly clothed at and towards the base with soft hairs—upper palet membranaceous, 2-toothed, base of the flower often cob-webby; stamens 2 or 3; stigmas simply plumose; grain oblong, free; culms tufted, from perennial roots, except No. 1; leaves smooth, usually flat and soft.

Poa, an ancient Greek name for grass or fodder.

1. Poa Annua (Annual Meadow Grass or Low Spear Grass.

SPECIFIC CHARACTER.

Culms flattened; panicle often 1-sided; spikelets crowded, very short pedicelled, 3 to 7-flowered. Common.

Poa Annua is not, as its name implies, permanent, yet being in flower at different periods during the whole of the summer, it produces seeds even when mown or fed, which spring again, and thus it forms a part of the sward as constantly as if it were perennial. Cattle of every kind are fond of it, and it is thought to have a peculiarly good effect in improving the quality of the butter, though its produce is comparatively small.

2. P. Compressa (Flat Stalked or Creeping Poa—green grass, blue grass, wire grass). See page 46.

3. P. Alpina (Alpine or Mountain Poa). Isle Royal, Lake Superior, Maine, and northward.

4. P. Laxa (Wavy Meadow Grass). High, rocky hills, New York and New England, and northern latitudes.

5. C. Cæsia. Similar to Poa Nemoralis. Wood meadow grass.

6. P. Serotina (Fowl Meadow Grass, False Red Top). See page 49.

7. P. Pratensis (Smooth Stalked Poa—green or common meadow grass, June grass, Kentucky blue grass). See page 41.

8. P. Trivialis (Rough Stalked Poa, or Rough Stalked Meadow Grass). See page 47.

9. P. Sylvestris, *Gray* (Sylvan Spear Grass). Found in rocky woods and meadows, New York to Pennsylvania, and Virginia to Wisconsin.

10. P. Debilis (Weak Meadow Grass). Rocky Woodlands from New England to Wisconsin.

11. Poa Alsodes, *Gray* (Wood Spear Grass). Woods on hillsides, from New England to Pennsylvania and Wisconsin.

12. P. Flexuosa (Southern Spear Grass). Dry woods, Virginia, Kentucky, and southward.

13. P. Brevifolia (Short Leaved Spear Grass). The root leaves long, nearly equalling the stem. Rocky or hilly woodlands. Pennsylvania to Virginia, and westward.

14. P. Nemoralis (Wood Meadow Grass). Has the peculiar property of flowering under the shade of trees, which renders it valuable on land which either contains forest timber, or which is closely fenced by plantations, which is the case in almost all demesnes in England.

In Mr. Taunton's experiments the plants were completely overpowered by other grasses. I found the same difficulty in raising it this year, although I took every pains to clear the ground of weeds and roots of grasses, and sowed a liberal quantity of seed, yet the natural grass overpowered it and kept it down. I have again cleared the ground thoroughly, and will repeat the experiment by sowing again this month (August).

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35. ERAGROSTIS—Beauv. Eragrostis.

GENERIC CHARACTER.

Spikelets 2 to 70-flowered, nearly as in Poa, except that the lower palet is but 3 (rarely 1) nerved, not webby-haired at the base and deciduous, and the upper one persistent on the rhachis after the rest of the flower has fallen ; culms often branching ; leaves linear, frequently involute, and the ligule or throat of the sheath bearded with long villous hairs ; panicle various.

An early name, probably from *era*, earth, and *agrostis*, in allusion to the procumbent habit of the original species.

1. Eragrostis Repians (Creeping Meadow Grass). Common, gravelly river borders. Flowers in August.

2. E. Poæoides (Strong Scented Meadow Grass). Sandy waste places, eastward; scarce. Variety Megastachya. Similar situations, and more common. Flowers in August. Emits a sharp, unpleasant odor.

3. E. Pilosa (The Slender Meadow grass). Sandy or gravelly waste places, New England to Illinois, and southward.

4. E. Frankii (Short Stalked Meadow). Low or sandy ground in Ohio, Illinois, and southwestward.

5. E. Purshii (Southern Eragrostis). Sandy or sterile open grounds, New Jersey to Virginia, and southward.

6. E. Tenuis, *Gray* (Branching Spear grass). Sandy soil, Illinois, Virginia, and southward.

7. E. Capillaris (Hair-panicled Meadow grass). Leaves and sheaths hairy. Common, especially southward. Flowers August and September.

8. E. Pectinacea (Meadow Comb grass.) Sandy, dry ground, from Eastern Massachusetts, near the coast, and from Ohio and Illinois, southward.

36. BRIZA—Linn. Quaking Grass.

GENERIC CHARACTER.

Spikelets many-flowered, ovate or heart-shaped, flattish tumid, the flowers closely imbricated; glumes roundish, unequal (purple); lower palet roundish and entire, flattened parallel with the glumes, ventricose on the back, heart shaped at the base, papery membranaceous and becoming dry, scarious margined, obscurely many-nerved, the upper palet much smaller, ovate, flat; stamens 3; stigmas branched plumose; grain flattened, parallel with the palets, adhering to the upper one; leaves flat; panicle loose, diffuse, with the large and showy spikelets often drooping on delicate pedicels.

Whence the name, an ancient Greek appellation for some kind of grain, from *brizo*, to slumber, or *britho*, to bend downwards.

1. B. Media (quaking grass). See page 61.

There are orher species of this grass grown as ornamental grasses.

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37. FESTUCA—Linn. Fescue Grass.

GENERIC CHARACTER.

Spikelets 3-many-flowered, panicled or racemose, the flowers not webby at the base; glumes unequal mostly keeled; palets chartaceous or almost coriaceous, roundish (not keeled) on the back, more or less 3 to 5 nerved, acute, pointed, or often bristle-

awned from the tip, rarely blunt, the upper mostly adhering at maturity to the enclosed grain; stamens 1 to 3; flowers, and often the leaves, rather dry and harsh.

An ancient Latin name.

1. F. Myurus. Dry fields, New Jersey, Southern Pennsylvania, and southward.

2. F. Tenella (Small Fescue). Dry sterile soil southward.

3. F. Ovina (Sheep's Fescue). See page 52.

4. F. Duriuscula (Hard Fescue). See page 53.

5. F. Rubra (The Red Fescue). This is a variety of Festuca Duriuscula, slightly altered in habit from growing always on light, dry, sandy soils. It is distinguished, however, by its creeping roots, broader and generally darker-colored foliage, and producing a smaller number of stems. From its creeping-rooted habit, it is comparatively of little use to the Agriculturist, except for sowing on light, sandy sea-coasts after the shifting sand has been consolidated.

Naturalized eastward; wild, Lake Superior and northward.

6. F. Elatior (Taller or Meadow Fescue). See page 55.

7. F. Futans (The Nodding Fescue). Panicle diffuse, composed of several long, slender branches, generally in pairs, nodding when ripe. Rocky woods and copses. Culm 2 to 4 feet high, leaves often rather hairy. Flowers in July.

38. BROMUS—Linn. Broom Grass.

GENERIC CHARACTER.

Spikelets 5-many-flowered, panicled; glumes unequal, membranaceous, the lower 1 to 5, the upper 3 to 9-nerved; lower palet either convex on the back or compressed-keeled, 5 to 9-nerved, awned or bristle-pointed from below the mostly 2-cleft tip, upper palet at length adhering to the groove of the oblong or linear grain; stamens 3; styles attached below the apex of the ovary. Coarse grasses, with large spikelets, at length drooping on pedicels thickened at the apex.

An ancient name for the oat, from *bromos*, food.

1. Bromus Secalinus, (Chess, Cheat, Willard's Bromus).

SPECIFIC CHARACTER.

Panicle spreading, even in fruit, the drooping pendunculs little branched; spikelets oblong-ovate, turgid, smooth, 8 to 10 rather distant flowers; lower palet rather longer than the upper, short-awned or awnless; sheaths nearly glabrous.

In England this plant is called goose grass. It is a well-known weed in wheat and rye fields, and is easily distinguished by its large hanging panicles, large drooping spikelets, and the seeds, when ripe, somewhat resembling rye. These seeds when ground amongst flour and made into bread, impart to it a bitter taste, and are said to produce the same dangerous effects as those of the bearded darnel (Lolium Temeltum).

Flowers in June and July.

2. Bromus Racemosus (Smooth Broom or Upright Chess). Is often mistaken for B. Secalinus ; it is also common in grain fields. Worthless for cultivation, except for green manuring.

3. B. Mollis (Soft Chess, or Soft Downy Broom grass).

This is also a common weed in rye grass fields in England, particularly the B. Racemosus. They both grow much taller than the rye grass, and have large, branching, drooping panicles, and are distinguished from one another by the smoothness and downiness of their spikelets ; the seeds of B. Mollis are said to produce giddiness in the human species and quadrupeds, and to prove fatal to poultry. In a sample of rye grass seeds, it is very easy to detect B. Mollis or B. Racemos, by their being larger, much broader towards the points, etc.

Flowers in June.

4. B. Kalmi, *Gray* (Wild Chess). Flowers in June and July.

5. B. Ciliatus (Fringed Broom grass). Flowers July and August.

6. B. Asper.

7. B. Steriles (Sterile Broom grass). Rare.

8. B. Pratensis (Meadow Broom grass). Fibrous rooted perennial, height two to three feet ; flowers in July. Said to be a native of some parts of England.

From the softness and great length of the foliage of this grass, it may turn out one of the most useful

in the genus, but as yet its properties are not sufficiently known. Leaves long, slender, and pendulous.

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39. UNIOLA—Linn. Spike Grass.

GENERIC CHARACTER.

Spikelets closely many-flowered, very flat and 2-edged, one or more of the lower flowers sterile (neutral) and consisting of a single palet; glumes lanceolate, compressed-keeled. Lower palet coriaceo-membranaceous, strongly laterally compressed and keeled, striate-nerved, usually acute or pointed, entire, enclosing the much smaller compressed 2-keeled upper one and the free laterally flattened smooth grain Stamens 1 (or in U. Panticulata 3). Upright smooth perennials, growing in tufts from strong creeping rootstocks, with broad leaves and large spikelets in an open or spiked panicle.

An ancient name of some plant, a diminutive of *unio*, unity.

1. U. Paniculata (Spike grass). Sand hills, seashore, S. Virginia and southward.

2. U. Latifolia (Broad Leaved Spike grass). Shaded rich hill sides, S. Pennsylvania to Illinois, and southward.

3. U. Gracilis (Slender spike grass). Sandy soil from Long Island to Virginia, near the coast and southward. Flowers in August; stem three feet high.

40. PHRAGMITES—*Trin.* Reed.

GENERIC CHARACTER.

Spikelets 3 to 7-flowered, the flowers rather distant, silky villous at their base, and with a conspicuous silky-bearded rhachis, all perfect and 3-androus, except the lowest, which is either neutral or with 1 to 3 stamens, and naked; glumes membranaceous, shorter than the flowers, lanceolate, keeled, sharp-pointed, very unequal; palets membranaceous, slender, the lower narrowly awl-shaped, thrice the length of the upper; squamulæ 2, large; styles long; grain free. Tall and stout perennials, with numerous broad leaves and a large terminal panicle.

Phragmites, a Greek word, i. e., growing in hedges, which this aquatic grass does not.

1. P. Communis (The Common Reed grass). A very tall, broad-leaved grass. It looks at a little distance like broom corn. Stem 5 to 12 feet high; leaves 2 inches wide; grows on the edges of ponds. This is one of the largest grasses in the United States.

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41. ARUNDINARIA—Mich. Cane.

GENERIC CHARACTER.

Spikelets flattened, 5 to 14-flowered, the flowers somewhat separated on the jointed rhachis; glumes very small, membranaceous, the upper one larger; palets herbaceous or somewhat membranaceous, the

lower convex on the back, many-nerved, tapering into a mucronate point or bristle; squamulæ 3, longer than the ovary; stamens 3; grain oblong, free. Arborescent or shrubbery grasses, simple or with fascicled branches, and with large spikelets in panicles or racemes, the flowers polygamous.

Name from *arundo*, a reed.

1. Arundinaria Macrospirma (Large Cane). River banks, S. Virginia, Kentucky, and southward, forming cane-brakes; the stems are extensively used for fishing rods.

2. A. Tecta (Small Cane). Swamps and moist soil, Virginia, Illinois, and southward.

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42. LEPTURUS—R. Br. LEPTURUS.

GENERIC CHARACTER,

Spikelets solitary on each joint of the filiform rhachis, and partly immersed in the excavation, 1 to 2-flowered; glumes 1 to 2, including the 2 thin pointless palets; stamens 3; grain free, oblong-linear, cylindrical. Low and branching, often procumbent grasses, chiefly annuals, with narrow leaves and slender spikes.

Whence the name, from *leptos*, slender, and *oyra*, a tail.

1. L. Paniculatus (Slender Tail grass). Open grounds and salt licks, Illinois and westward. Rare.

43. LOLIUM—Linn. DARNEL.

GENERIC CHARACTER.

Spikelets many-flowered, solitary on each joint of the continuous rhachis, placed edgewise ; the glume, except in the terminal spikelet, only 1 (the upper) and external, otherwise nearly as in Triticum.

Ancient Latin name.

1. Lolium Perenne (Perennial Rye grass). See p. 30.

2. L. Italicum (Italian rye grass). See page 32.

3. L. Annum (Annual Rye grass). See page 34.

4. L. Temulentum (Bearded Darnel).

SPECIFIC CHARACTER.

Root annual; culm taller, glume fully equalling the 5 to 7-flowered spikelet; awn longer than the flower (one-half inch long). Grain fields, rare. Grain noxious, almost the only instance of the kind among grasses.

Gray.

5. L. Multiforum (the Many-flowered Darnel). The most showy of the rye grasses.

Cultivated to some extent in France ; introduced into England, but not much attention given its cultivation. Very rare in this country.

There are many varieties of the perennial rye grass grown in England, amongst the best of which may be enumerated Russell's, Whitworth's, Pacey's, Ruck's, and many others of considerable merit.

44. TRITICUM—Linn. Wheat.

GENERIC CHARACTER.

Spikelets 3-several-flowered, single at each joint, and placed with the side against the rhachis; glumes transverse (i. e., right and left), nearly equal and opposite, herbaceous, nerved; lower palet very like the glumes, convex on the back, pointed or awned from the tip, the upper flattened, bristly-ciliate on the nerves, free or adherent to the groove of the grain; stamens 3.

The classical name, probably from *tritus*, beaten, because the grain is beaten out of the spikes.

The true species are annuals, with the glumes ovate-oblong, turgid, and boat-shaped, as in common wheat. Others are perennial, with nearly lanceolate glumes, and 2-ranked spikes, never furnishing bread corn.

(§ Agropyron, Gærtn., to which the following belong.)

Flowers in summer.

1. Triticum Repens, *Linn.* (Couch, Quitch, or Quick grass, Twitch grass, Dogs' grass, Chandler grass, etc.)

This well-known troublesome grass, of which there are many varieties, is relished by cattle, both in a green and dried state, but from its coarse nature is rather difficult to be cured for hay at the late season of the year when it is fit for cutting for that purpose. I have experimented with the large variety this year, and am so well satisfied with the results, that I in-

tend sowing an acre of good land with it for summer pasturage.

The single plants met with in gardens and amongst field crops are certainly objectionable, on account of their "long, creeping roots, branching in every direction, taking complete possession of the soil, and impoverishing it;" but when grown in a body this is very much obviated, and very likely to counteract, to a great extent, its scourging habits.

2. T. Dasytachyum, *Gray*. Sandy shores of Lakes Huron and Superior, and northward.

3. T. Caninum (Awned Wheat grass). It has no creeping rootstalks, like Couch grass. Is found in woods and banks of streams, from New York to Wisconsin, and northward.

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45. HORDEUM—Linn. Barley.

GENERIC CHARACTER.

Spikelets 1-flowered, with an awl-shaped rudiment on the inner side, three at each joint of the rhachis, but the lateral ones usually imperfect or abortive, and short-stalked; glumes side by side in front of the spikelets, six in number, forming a kind of involucre, slender, and awn-pointed or bristle form; palets herbaceous, the lower (anterior) convex, long-awned from the apex; stamens 3; grain oblong, commonly adhering to the palets; spike often separating into joints. Ours are annuals or biennials, or scarcely perennials.

Gray.

An ancient Latin name.

1. Hordeum Jubatum (Squirrel Tail grass). Common on moist sands and marshy places near sea shore and northern lakes in Wisconsin, Iowa, and Minnesota.

Flowers in June.

2. H. Pratense. Plains, especially in saline soil, Ohio to Illinois, and westward.

Flowers in May and June.

3. H. Pussilum (Barley grass). Annual. Relished by cattle.

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46. ELYMUS—Linn. Lyme Grass, Wild Grass.

GENERIC CHARACTER.

Spikelets 2 to 4 at each joint of the rhachis, all fertile and alike, sessile, each 1 to 7-flowered; glumes conspicuous, nearly side by side in front of the spikelets, 2 for each spikelet, forming an involucre to the cluster. Palets coriaceous, the lower rounded on the back, acute or awned at the apex; grain adherent to the involving palets.

Whence its name, an ancient one for some grain, from *elyo*, to roll up.

1. E. Virginicus (Lyme grass, Wild Rye). River banks, from New England to Illinois, and Wisconsin.

2. E. Canadensis (Canadian Lyme grass). Common on river banks; also Var. Glaucifolias, same.

3. E. Sibericus (Siberian Lyme grass). See page 74.

4. E. Striatus (Slender, Hairy Lyme grass). Of no agricultural value.

5. E. Mollis (Soft Lyme grass). Shore of the Great Lakes, Maine and northward.

6. E. Arenarius (Upright Sea Lyme grass). See page 75.

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47. GYMNOSTICHUM—Screb. Bottle Brush Grass.

GENERIC CHARACTER.

Spikelets 2 to 3 or sometimes solitary on each joint of the rhachis, raised on a very short callous pedicel, loosely to to 4-flowered (when solitary flatwise on the rhachis); glumes none, or small, awnlike, and deciduous.

Whence the name, *gymnos*, naked, and *stichos*, rank. Otherwise nearly as in Elymus.

1. G. Hystrix (Bottle Brush grass). The spike has the appearance of a bottle brush, when ripe.

Moist woodlands. Flowers in July.

48. DANTHONIA—De Candolle. Wild Oat Grass.

GENERIC CHARACTER.

Lower palet (oblong or ovate, rounded, cylindraceous, 7 to 9-nerved) bearing between the sharp-pointed or awn-like teeth of the tip an awn composed of the 3 middle nerves, which is flattish and spirally twisting at the base, otherwise nearly as in Avena; glumes longer than the imbricated flowers. Ours perennials, 1 to 2 feet high, with narrow and soon involute leaves, hairy sheaths bearded at the throat, and a small, simple panicle or raceme of about 7-flowered spikelets.

Named from Danthoine, a French botanist.

1. D. Spicata (Wild Oat grass, White Top, Old Fog). Is common in dry, sunny pastures. Flowers in June.

2. D. Sericea (Taller Wild Oat Grass). Taller than D. Spicata, and not tufted; 1 to 3 feet high. Dry or moist sandy soils, Southern Massachusetts, New Jersey, and southward. Flowers in June.

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49. AVENA—Linn. Oat.

GENERIC CHARACTER.

Spikelets 2 to many-flowered, panicled, the flowers herbaceo-chartaceous, or becoming harder, of firmer texture than the large and mostly unequal glumes,

the uppermost imperfect; lower palet rounded on the back, mostly 5 to 11-nerved, bearing a long, usually-bent twisted awn on the back or below the acutely 2-cleft tip proceeding from the mid-nerve only; stamens 3; grain oblong, linear, grooved on one side usually hairy, at least at the top, free but invested by the upper palet.

The classical Latin name.

The common oat. Avena Sativa represents the large-flowered annual species of the Old World. The following are smaller-flowered, indigenous perennials:

1. A. Striata (Purple Wild Oat). Rocky, shaded hills, New England, New York, and northward.

2. A. Smithii (Smith's Oat Grass). Grows from two and a half to four and a half feet high. Woods near Sault Ste., Maine.

3. A. Flavescens (Yellow Oat grass). See page 58).

4. A. Pratensis (Meadow Oat grass). Native of the pastures of Great Britain. Flourishes best on dry soils, and furnishes a medium quality of hay.

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50. TRISETUM—Persoon. Trisetum.

GENERIC CHARACTER.

Spikelets 2 to several-flowered, often in a contracted panicle, the lower palet compressed-keeled, of about the same membranaceous texture as the glumes, bearing

a bent or flexuous (rarely twisted) awn below the sharply 2-toothed or two pointed apex.

Whence the name, from *tris*, three, and *seta*, a bristle.

Otherwise nearly as in Avena. Ours are perennials.
Gray.

1. T. Subspicatum, *Beauv. Var.* molle (Downy Persoon). Found on rocky river banks, from New England to Wisconsin, and northward. Flowers in July. About 1 foot high; leaves flat, short.

2. T. Palustre (Marsh Oat grass). Low grounds Southern New York to Illinois and northward.

3. T. Pubescens (the Downy Oat grass). See page 60.

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51. AIRA—Linn. Hair Grass.

GENERIC CHARACTER.

Spikelets small in an open diffuse panicle, of 2 perfect flowers and often with the pedicel or rudiment of a third, all usually shorter than the membranaceous-keeled glumes, and hairy at the base, the upper remotish; lower palet thin and scarious, 2-cleft or else truncate, and mostly denticular or eroded at the summit, bearing a slender bent or straight awn on its back, commonly near its base; stamens 3; styles plumose to the base; ovary glabrous; grain oblong.

An ancient Greek name for Darnel.

1. A. Flexuosa. (Wood Hair Grass, or common Hair Grass.)

Remarks. This Grass is also called Zigzag Hair Grass. Height one and a half to two feet; flowers in June and July. Grows naturally on healthy soits in England, and has been recommended for sowing on such, but as its chief produce consists in culms or stems with very little foliage, and few joints, and as cattle do not seem to relish the former, it is scarcely deserving of culture, except perhaps, in small quantities as a mixture on moorish soils. This is a common Grass in this country on dry and rocky hills and roadsides. It is sometimes found at a high altitude on mountains and hills above the level of the sea. Sheep eat it readily.

2. A. Cæspitosa. Tufted Hair Grass.

SPECIFIC CHARACTER.

Culm tufted, 2 to 4 feet high, leaves flat, linear, panicle pyramidal or oblong, 6 inches long, awn straight, barely equaling the palet. Shores of lakes and streams; common Northward. Flowers in June and July.

Flowers in latter end of July in England. Grows naturally on rather superior marsh or damp soils, forming large tufts or hassocks, as they are sometimes termed; and as the grass is scarcely eaten by domestic animals, it becomes the business of the farmer to extirpate these as soon as possible, not only on account of their unsightly appearance, but because they occupy a considerable portion of the soil which would otherwise be capable of producing more valuable grasses, particularly as these tufts or

hassocks are generally the most predominant on the best of soils. The most effectual manner of accomplishing this is to root them fairly out with a large hoe, afterwards stirring the soil and scattering in a few seeds of any of the strong or superior fast growing grasses, such as the orchard grass, or agrostis, stolonfera, &c.

3. Aira Praecox. Sandfields—New Jersey to Virginia, rare. Naturalized from Europe.

4. A. Caryophyllea. Dry fields, Nantucket; also New Castle, Delaware.

5. A. Atropurpurea. (Purple Alpine Hair Grass.) Alpine tops of the White Mountains, and those of Northern New York.

6. A. Aquatica. (Water Hair Grass.) This is an aquatic grass but can be cultivated on marshy grounds. It is one of the sweetest of British grasses, and cattle are very partial to it. Water fowl feed on the seeds of this grass.

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52. ARRHENATHERUM AVENACEUM. Beauv. Oat Grass.

GENERIC CHARACTER.

Spikelets open panicled, 2-flowered with the rudiments of a third flower; the middle flower perfect, its lower palet barely bristle-pointed from near the tip; the lowest flower staminate, only bearing a long bent awn below the middle of the back.

Whence the name, from *arren*, masculine, and *ather*, awn, otherwise as in Avena, of which it is only a peculiar modification.

1. A. Avenaceum (Tall Meadow Oat Grass,) or tall Oat Grass. See page 37.

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53. HOLCUS. Linn. Meadow Soft Grass.

GENERIC CHARACTER.

Spikelets crowded in an open panicle, 2-flowered, jointed with the pedicils; the boat-shaped membranacious glumes enclosing and much exceeding the remotish flowers. Lower flower perfect; its papery or thin coriacious lower palet awnless and pointless; the upper flower staminate, otherwise similar, but bearing a stout bent awn below the apex. Stamens 3, styles plumose to the base, grain free.

An ancient name, from *olkos*, attractive, of obscure application.

1. H. Lanatus (Woolly Soft grass, or Meadow Soft grass, Velvet grass). See page 62.

2. H. Mollis (the Creeping Soft grass). See page 64.

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54. HIEROCHLOA—Gamelin. Holy Grass.

GENERIC CHARACTER.

Spikelets 3-flowered, open panicled, the flowers all with 2 palets, the two lower (lateral) flowers stamin-

ate only, 3-androus, sessile, often awned on the middle of the back or near the tip, the uppermost (middle) one perfect, short pedicelled, scarcely as long as the others, 2-androus, awnless; glumes equalling or exceeding the spikelet; scarious—palets chartaceons. Perennials; leaves flat.

Name composed of *ieros*, sacred, and *chloa*, grass, these sweet-scented grasses being strewn before the church doors on saints' days, in the north of Europe.

1. H. Borealis (Vanilla or Seneca grass). Moist meadows; of little value for cultivation. Flowers in May.

2. H. Alpina (Alpine Holy grass) Is found on mountain tops in New England and New York, and northward.

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55. ANTHOXANTHUM ODORATUM—Linn.
Sweet Vernal Grass.

GENERIC CHARACTER.

Spikelets spiked panicled, really 3-flowered, but the lateral flowers neutral, consisting merely of one palet, which is hairy on the outside and awned on the back, the central (terminal) flower perfect, small, or 2 awnless chartaceous palets, 2 androus; glumes very thin, acute, keeled, the upper about as long as the flowers, twice the length of the lower; squamulæ none; grain ovate, adherent.

Name compounded of *anthos*, flower, and *anthon*, of flowers. L.

1. A. Odoratum (Sweet Scented Vernal). See page 57.

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56. PHALARIS—Linn. Canary Grass.

GENERIC CHARACTER.

Spikelets crowded in a clustered or spiked panicle, with 2 neutral mere rudiments (a scale or pedicel) in place of lateral flowers, one on each side, at the base of the pereect one, which is flattish, awnless, of 2 shining palets, shorter than the equal boat-shaped and keeled glumes, finally coriaceous or cartilaginous, and closely enclosing the flattened, free, and smooth grain ; stamens 3 ; leaves broad, mostly flat.

The ancient name, from *phalos*, shining, alluding either to the palets or grain.

1. P. Canariensis (The Common Canary grass). This grass is cultivated for the sake of its seed for the canary bird. Flowers in Tuly and August.

Waste places and roadsides, from Massachusetts to Pennsylvania.

2. P. Arundinacea (Reed-like Canary grass).

Remarks.—A dark, reddish-color seed, long, smooth and shining root, creeping height 4 to 6 feet ; flowers in July. Grows naturally on alluvial soils by the sides of rivers, lakes, pools, etc. According to the experiments of Sir H. Davy, this grass contains a considerable portion of nutritious matter, but from

its coarseness, cattle in general refuse to eat it, but are said to eat it if cut into chaff and mixed with other food. It yields a vast bulk of hay, which in some parts is found very convenient for littering cattle.

The common Gardener's Gaiter is a variety of this grass.

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57. MILIUM. Millet Grass.

GENERIC CHARACTER.

Spikelets diffusely panicled, not jointed with their pedicels, apparently consisting of 2 equal membranaceous convex and awnless glumes, including a single coriaceous awnless flower, but theoretically the lower glume is wanting, while an empty single palet of the lower (neutral) flower, resembling the upper glume, fulfils its office, and stands opposite the narrow upper palet of the terete fertile flower; stamens 3; stigmas branched, plumose; grain not grooved, enclosed in the palets, all deciduous together.

The ancient Latin name of the Millet, which—however, belongs to a different genus—probably from *mille*, a thousand, because of its fertility.

Gray.

1. M. Effusium (Millet grass). Of very little agricultural value.

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58. AMPHICARPUM.

GENERIC CHARACTER.

Spikelets joined with the apex of the pedicels, apparently 1-flowered, of two kinds; one kind in a ter-

minal panicle, like those of milium, except that the rudiment of the lowest glume is ordinarily discernible, and deciduous from the joint, without ripening fruit, although the flower is perfect; the other kind solitary at the extremity of slender, runner-like radical peduncles (which are more or less sheathed towards the base) much larger than the others, perfect and fertile, subterranean, fertilized in the bud; the enwrapping glume and similar empty palet many-nerved. Flower oblong or ovoid, pointed. Stamens 3—small in the radical flowers, Stigmas plumose, deep purple. Grain not grooved, in the radical flowers very large, the embryo next the lower palet. Neutral palet somewhat exceeding the glume and the fertile flower.

Name from *amphikarpos*, a Greek word, signifying doubly fruft-bearing.

1. Amphicarpum (Double-bearing Amphicarpum). Moist, sandy pine barrens New Jersey and in the Southern States. Flowers in September.

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59. PASPALUM. Paspalum.

GENERIC CHARACTER.

Spikelets spiked or somewhat racemed in 2 to 4 rows, on one side of a flattened or filiform continuous rhachis, jointed with their very short pedicels, plano-convex, awnless, apparently only 1-flowered, as in Milium, but on the other hand differing from Panicum merely in the want of the lower glume,

which, however, is occasionally present in some species, as a small scale; glume and empty palet few-nerved; flower coriaceous, mostly orbicular or ovate, flat on the inner side, convex on the outer; stamens 3.

Said to have been an ancient Greek name for Millet.

1. Paspalum Fluitans (Floating Paspalum). River swamps, Virginia, Southern Ohio, Illinois, and southward. Flowers in September and October.

2. P. Watterianum. Low and wet grounds New Jersey and southward.

3. P. Setaceum (Hairy Slender Paspalum). Sandy fields, from Massachusetts, Illinois, and southward. Flowers in August.

4. P. Læve (Smooth Erect Paspalum) Moist soil, New England to Kentucky, and southward. Flowers in August.

5. P. Distichum (Joint grass). Wet fields, Virginia and southward. Flowers in July and September.

6. P. Digitaria (Finger Shaped Paspalum). Slender and sparsely flowered. Virginia and southward.

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60. PANICUM. Panic Grass.

GENERIC CHARACTER.

Spikelets panicled, racemed, or sometimes spiked, not involucrate, 1½ to 2-flowered; glumes 2, but the

lower one usually short or minute (rarely ever wanting), membranaceo-herbaceous, the upper as long as the fertile flower; lower flower either neutral or staminate, of one palet, which closely resembles the upper glume, and sometimes with a second thin one; upper flower perfect, closed, coriaceous or cartilaginous, usually flattish, parallel with the glumes, awnless, except in Digitaria, enclosing the free and grooveless grain; stamens 3; stigmas plumose, usually purple.

An ancient Latin name of the Italian millet, P. Italicum, now Setaria Italica. Thought to come from *panis*, bread—some species furnishing a kind of bread corn.

1. P. Filiforme (Slender Crab grass). Somewhat resembling paspalum digitaria. Sandy soils near the coast. Flowers in August.

2. P. Glabrum (Smooth Crab grass). Common in cultivated grounds. A troublesome weed. Flowers in August.

3. P. Sangninale (Common Crab or Finger grass). In cultivated and waste grounds, a troublesome weed. Flowers from August to October.

4. P. Anceps (Double-headed Panic). Wet, sandy soil, New Jersey and Pennsylvania, to Virginia and southward. Flowers in July and August.

5. P. Agrostoides (Agrostis-like Panic grass). Wet meadows and borders of rivers, from Massachusetts to Virginia, Illinois and southward. Flowers in July and August.

6. P. Proliferum (Prolific Panic grass). Grows on brackish marshes, river banks and shores.

Cattle are fond of this grass. Flower in August.

7. P. Capillare (Hair Stalked Panic grass, Old Witch grass). Sandy soils and cultivated fields, everywhere. Flowers in August.

8. P. Autumnale (Autumn Panic). Sand hills, Mason county, Illinois, and southward.

9. P. Virgatum (Tall Smooth Panic grass). Moist sandy soil; common—especially southward.

10. P. Amarum (Bitter Panic). Sandy shores of Connecticut, and southward. Flowers in August and September.

11. P. Latifolium (Broad-leaved Panic grass). Moist thickets; common. Flowers in June and August.

12. P. Clandlistinum (The Hidden-flowered Panic grass). Low thickets and river banks; common. Flowers from June to September.

13. P. Microcarpan. Dry, moist thickets, Pennsylvania and Michigan to Illinois, and southward. Flowers in July and September.

14. P. Xanthophysum (Yellow Panic grass). Plant yellowish green. Sandy soil. Maine to Wisconsin, and northward. Rare. Flowers in June.

15. P. Viscidum (Sticky Panic grass). Densely velvety, downy all over, including the sheath. Damp

soil, New Jersey to Nirginia, and southward. Flowers in August.

16. P. Pauciflorum (Few-flowered Panic). Is found in wet meadows and copses, Massachusetts to Wisconsin, and southward. Flowers in June and July.

17. P. Dichotomum (Polymorphus Panic). Is common in all parts of the country on dry and low grounds. Flowers in June and August.

18. P. Depauperatum (Worthless Panic). Stems simple, forming close tufts. Dry woods and hills. Rather common. Flowers in June.

19. P. Verrucosum (Warty Panic). Spikelets oval, roughish, with warts, dark green.
New England to Virginia, and southward, in sandy swamps near the coast. Flowers in August.

20. P. Crus Galli (Barn Yard Grass). This grass is relished by stock, and is deserving cultivation. It grows on moist, rich, or manured soils, and along the coast in ditches. Flowers in September and October.

21. P. Millaceum (Common Millet).

SPECIFIC CHARACTER.

Flowers in large, open, nodding panicles; leaves lance-shaped, broad; stem 1 to 2 feet high. Native of Turkey.

Flint.

This grass has long been cultivated in this country, but has often been confounded with other varieties. Common millet, p. millaceum, grows in a panicle, and has something the appearance of dwarf broom corn. It grows about three feet high, and has a dense mass of leaves and stalks, furnishing a large amount ot forage for cattle. It bears a good crop of seed, but as this does not ripen together, it is more valuable as a fodder crop. It is generally conceded that it requires a dry, rich soil, with any fertilizer, and may be sown any time in the spring, from the middle of April to the end of June. If for fodder, broadcast, at the rate of one to one rnd a half bushels of seed per acre. If sown in drills, twelve quarts will be be sufficient. It is necessary to have the land smooth, and cover evenly, not too deep,, and roll afterwards. Harvest when the seed is swelling, and cure same as Timothy. The seeds weigh 40 lbs. to the bushel.

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61. SETARIA—Beauv. Bristly Foxtail Grass.

GENERIC CHARACTER.

Spikelets altogether as in Panicum proper, and awnless, but with the short peduncles produced beyond them into solitary or clustered bristles resembling awns, but not forming an involucre; inflorescence a dense spiked panicle, or apparently a cylindrical spike. Annuals, in cultivated or manured grounds, with linear or lanceolate flat leaves, properly to be regarded as merely a sub-genus of Panicum.

Name from *seta*, a bristle.

1. S. Verticillata (The Bristly Foxtail).

SPECIFIC CHARACTER.

Spike cylindrical (2 to 3 inches long, pale green), composed of apparently whorled short clusters; bristles short, adhesive. Found near dwellings, though rarely.

2. S. Glauca (Bottle grass—sometimes called Foxtail).

SPECIFIC CHARACTER.

Spike cylindrical, dense, tawny yellow (2 to 4 in. long); bristles 6 to 11 in a cluster, much longer than the spikelets, perfect flower, transversely wrinkled; stem from 1 to 3 feet high; very common in stubble. Flowers in July.

3. S. Viridis (The Green Foxtail; also called Bottle grass).

SPECIFIC CHARACTER.

Spike nearly cylindrical, more or less compound, green; bristles few, longer than the spikelets; perfect flower, striate lengthwise and dotted; common in cultivated ground.

4. S. Italica (Italian Millet or Bengal grass).

SPECIFIC CHARACTER.

Spike compound, interrupted at the base, thick, nodding (6 to 8 in. long), yellowish or purplish); 2 or 3, in a cluster, either much longer, or else shorter than the spikelets.

Bengal grass is a native of India, where it bears the name of Congue. It has been introduced into, and acclimated in this country many years ago. It differs from Setaria Germanica, by having a stronger spike, larger seed, and requiring a warmer climate to bring it to maturity. Otherwise it is nearly the same. The method of cultivation observed and practiced with Millet and Hungarian grass will apply to Setaria Italica. The three grasses have done remarkably well with me this season. The drought did not affect them.

5. S. Germanicum (Hungarian Grass, Bristly Foxtail Grass). This grass has been cut and housed with me this season, inside of seventy days, and has fully borne out the *Prairie Farmer's* recommendations of it, for which, and directions for its cultivation, see page 76.

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62. CENCHRUS—L. Hedgehog or Bur Grass.

GENERIC CHARACTER.

Spikelets as in Panicum, awnless, but enclosed 1 to 5 together in a globular and bristly or spiny involucre, which becomes coriaceous and forms a deciduous hard and rigid bur, the involucre sessile in a terminal spike. Styles united below.

An ancient Greek name of Setaria Italica.

1. C. Tribuloides (Bur grass or Hedgehog grass). Grows in sandy soils near the salt water, where the

spikes assume a whitish appearance; and around the great lakes and larger rivers. A vile and troublesome weed.

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63. TRIPSACUM—L. Gama Grass, Sesame Grass.

GENERIC CHARACTER.

Spikelets monœcious, in jointed spikes, which are staminate above, and fertile below; staminate spikelets 2, sessile at each triangular joint of the narrow rhachis, forming a 1-sided and 2-ranked spike longer than the joints, both alike, 2-flowered; glumes coriaceous, the lower (outer), 1-nerved, the inner one boat-shaped; palets very thin and membranaceous, awnless; anthers—turning orange or reddish brown—opening by 2 pores at the apex; pistillate spikelets single, and deeply imbedded in each oblong joint of the cartilaginous thickened rhachis, occupying a boat-shaped recess, which is closed by the polished and cartilaginous ovate outer glume, the inner glume much thinner and pointed, 2-flowered—the lower flower neutral, palets very thin and scarious, pointless; styles united; stigmas very long (purple) hispid; grain ovoid, free; culms stout and tall, solid, from very thick creeping rootstocks; leaves broad and flat. Spikes axillary and terminal, separating spontaneously into joints at maturity.

Name from *tribo*, to rub, perhaps in allusion to the polished fertile spot.

1. T. Dactyloides (Gama grass or Sesame grass). Stout, coarse, and hardy, although not considered of

much value where better could be grown. Grows on moist soils near the coast, New England to Pennsylvania and Illinois, and common in Louisania.

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64. ERIANTHUS. Woolly Beard Grass.

GENERIC CHARACTER.

Spikelets spiked in pairs upon each joint of the slender rhachis—one of them sessile, the other pedicelled—otherwise both alike, with the lower flower neutral, of one membranaceous palet, the upper perfect, of 2 hyaline palets, which are thinner and shorter than the nearly equal membranaceous glumes, the palet awned from the tip; stamens 1 to 3; grain free. Tall and stout reed-like perennials, with the spikes crowded in a panicle, and clothed with long, silky hairs, especially in a tuft around the base of each spikelet.

Whence the name, from *erion*, wool, and *anthos*, flower.

1. E. Alopecuroides (Woolly Beard grass).

SPECIFIC CHARACTER.

Culm 4 to 6 feet high, woolly bearded at the joints; panicle contracted, the silky hairs longer than the spikelets, shorter than the awn; stamens 2.

Wet pine barrens, New Jersey and southward; rare. Flowers in September and October.

2. E. Brevibarbis (Short-awned Woolly Beard.)

SPECIFIC CHARACTER.

Culm 2 to 5 feet high, somewhat bearded at the upper joints ; panicle rather open ; silky hairs shorter than the spikelets.

Low grounds, Virginia and southward.

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65. ANDROPOGON. Beard Grass.

GENERIC CHARACTER.

Spikelets in pairs upon each joint of the slender rhachis, spiked or racemed, one of them pedicelled and sterile, often a mere vestige, the other sessile, with the lower flower neutral, and of a single palet, the upper perfect and fertile, of 2 thin and hyaline palets, shorter than the herbaceous or chartaceous glumes, the lower awned from the tip, ; stamens 1 to 3 ; grain free. Coarse, mostly rigid perennials, mostly in sterile or sandy soil, with lateral or terminal spikes, commonly clustered or digitate ; the rhachis hairy or plumose-bearded, and often the sterile or staminate flowers also.

Whence the name, composed of *aner*, *andvos*, man, and *pogon*, beard.

1. A. Furcatus (Finger Spiked Wood grass). This grass grows about 4 feet high, leaves nearly smooth, spikelets roughish, downy ; the awn bent. Flowers in September.

Common on sterile soils, rocky banks, and hillsides.

2. A. Scoparius (Purple Wood grass, Broom grass). This grass grows from one to three feet high; is found on sterile sandy soils. Flowers from July to September.

3. A. Argenteus (Silver Beard grass). Stems rather slender, 1 to 3 feet high; spikes in pairs, on peduncles, exceeding the sheaths, dense, and very silky.

Common on sterile soils in Virginia, and southward.

Flowers in September and October.

4. A. Virginicus (Virginia Beard grass). Stem flattish below, slender, 2 to 3 feet high. Sandy soil, Massachusetts to Virginia, Illinois and southward. Flowers from September to October.

5. A. Macrorus (Cluster-flowered Beard grass). Stem stout, 2 to 3 feet high, bushy, branched at the summit; numerous spikes, forming thick, leafy clusters. Low and sandy grounds, New York to Virginia, near the coast, and southward. Flowers from September to October.

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66. SORGHUM. Broom Corn.

GENERIC CHARACTER.

Spikelets 2 to 3 together on the ramifications of an open panicle, the lateral ones sterile or often reduced merely to their pedicels, only the middle or terminal one fertile, its glumes coriaceous or indurated, some-

times awnless, otherwise nearly as Andropogon; stamens 3.

The Asiatic name of S. Vulgare, the Indian Millet, to which species belongs Guinea Corn, Broom Corn, the Sweet Sorghum, and other cultivated races.

1. S. Nutans (Indian grass, Wood grass). Stem from 3 to 5 feet high; leaves linear, lanceolate-glaucous, sheaths smooth, the perfect spikelets at length drooping (yellowish or russet brown and shining), hairy at the base, awn twisted.

Dry soil. Common, especially southward.

Flowers in August and September.

2. S. Vulgare (Indian Millet Guinea Corn). In 1824 the seeds of the genuine Guinea grass was introduced into Cuba, and in a few years changed the economy of agricultural operations in the interior of the Island.

From Cuba it was introduced into Florida, and soon established its superiority over several other grasses that went by that name. Its cultivation has been principally confined to the Southern States ever since, where it is considered a necessary and valuable crop. It is sown either in drills or broadcast, same as sorghum or corn.

3. Sorghum Saccharatum (Broom Corn).

SPECIFIC CHARACTER.

Leaves linear, ligules short and hairy; panicle with long, loose, expanding branches; annual.

Flowers in August, growing from six to nine feet high.

This well-known plant is a native of India. Its panicles are used for brooms, and the seeds for poultry, swine, etc.

The immense quantities of brush, as the panicle of broom corn is called, which is manufactured into brushes and brooms, may easily be imagined, from the large number of those useful articles in daily use throughout the land.

The culture of broom corn is similar to that of Maize or Indian Corn. Early planting and careful tending. The cultivator should be kept going, close up to the rows, till the advance of the plants renders further work rather difficult. In the Mohawk Valley, where it has been successfully cultivated for many years, Gray's broom corn drill is used for drilling it in. The apparatus is gauged so as to drop four or five seeds at a time, the droppings or hills nine inches apart, the rows two feet nine inches wide, thus bringing it closer than the common corn. The stalk, in consequence, is slender, making a finer brush. This machine marks the rows, and plants and covers at the same time. A man and horse will work it.

There are two kinds of Broom Corn usually grown —the Mohawk and the Evergreen. This latter is considered the most profitable to grow, yielding about eight hundred pounds of brush per acre, while the common or Mohawk kind yields about six hundred. [Helmus Pier, Shaker agent, in 1871, planted three acres of Shaker Dwarf Broom corn on Mohawk Flats, and the produce, after cleaning, weighed 4,500 pounds, or at the rate of 1,500 lbs of clean brush per acre.]

The common Mohawk kind is fit to cut when the tops begin to redden. The Evergreen is cut as late as the season will admit, avoiding, if possible, the frost. The frost hurts it, bleaching it, and reducing the weight. If pretty well matured, and gathered before the frost, this variety makes a very fine article, green and elastic. The color enhances the price. The best brush is green and bright, and spongy, without brittleness. The evergreen is of this kind, and commands two or three cents per pound more in market.

When the season arrives for gathering, the brush is cut, leaving a butt or handle of about six inches in length, and is laid in small heaps, followed by the wagon, which carries it to the drying place, a barn or building, the size agreeing to the amount to be dried. It is cleared of its seed as it is brought in, by a machine made for that purpose. When relieved of its seed the brush is placed on laths or narow boards, ranged a few inches apart, so as to hold the brush, which is laid on crosswise. The entire floor of the building (if a barn, bays, and sheds included), is thus covered with laths and brush—the brush two or three thicknesses. If laid too thick, it will not readily dry, and it is necessary to have it as light as possible, and free from mould. Another tier is laid about ten or twelve inches above this, and so on to the roof. Ventilation is then given by removing boards at proper distances out of the sides of of the building. The circulation of air wants to be free and full. It takes about thirty days thus to dry the brush, which must be seen to and turned occasionally. When dry it is pressed—a hay press answering the purpose—two rows of brush, butts

outside, put together. It is pressed down hard, a bale weighing about three hundred pounds. It is then ready for market.

4. Sorghum Nigrum (Chinese Sugar Cane, Sorgho, or Sorgho Sucre.)

This plant is well known throughout the United States. It often attains the height of fifteen feet, according to the soil on which it grows. Erect at first, it appears like grass; as it advances in growth, it resembles Indian corn, and towards maturity Broom corn, to which it is nearly allied.

Flowers in a panicle at the top, at first green, changing through the shades of violet to purple when more advanced.

Perhaps no plant has ever been introduced into the Northern and Western States, which was better received, and had more attention paid to its cultivation for two or three years than the Chinese sugar cane. Its yield on favorable soils was in excess of any crop hitherto cultivated; and for soiling purposes it was admirably adapted to the tastes of all domestic animals. When allowed to mature for manufacturing purposes, the quality, more than the quantity, was the principal object to obtain.

It has been satisfactorily ascertained, in the numerous experiences in the reducing by evaporation of the green juices of different lots of the cane, that that which was grown on rich upland, or gravelly soils mixed with a portion of loam, always yielded the richest juice.

A three years' experience of its cultivation and manufacture convinces me of its superior worth and excellence, as one of the finest and most useful crops

a farmer can grow on his land, whether for the manufactured article, so healthy, palatable, and useful for family use, or the plant for soiling or fodder for stock of all kinds, which seem to relish it so much. That a plant so valuable should be laid aside so quickly, can only be accounted for on the main ground of its acquiring so much extra labor from the already overburdened (with work) farmers everywhere; that its cultivation for manufacturing purposes, under the existing state of high-priced labor, has to be abandoned; but for the use of cattle, it can be as cheaply raised as Indian corn grown for the same purposes. I have cultivated it in various ways, but have found sowing or dropping five or six seeds in a hill, one foot apart in the row, cultivated one way, to be the most satisfactory and profitable method.

The ground should be well prepared for it, by ploughing in well-rotted manure, and, before harrowing, sow fertilizers of some description, open drills, three and a half or four feet apart; drop seed, as already stated, five or six in a hill, one foot apart, and cover lightly. Afterwards keep the cultivator going, and one or two hand hoeings will, in most cases, be sufficient.

Cut before being caught by the frost. A few forked sticks, with rails stretched along them, will be found a very expeditious and convenient method for stacking, or rather placing the Sorghum against as it is cut. Stand it well up on both sides. In a day or so it may be stripped, and, as soon as possible afterwards, pressed, and boiled on the evaporator. This latter must be done by an experienced hand, as many a fine lot of sorghum has been spoiled by inexperi-

enced or careless operators. It will take from seven to ten gallons gallons of green juice to make one of salable syrups.

A few quarts of seed will be sufficient for an acre in drills as above.

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67. ZEA, MAIZE. Indian Corn.

GENERIC CHARACTER.

Spikelets 2-flowered; flowers monœcious, the staminate in terminal panicles; glumes 2; pales awnless, obtuse; the pistillate or fertile spikelets 2-flowered, with the lower one abortive; glumes 2, obtuse; pale awnless; fruit compressed.

For an extended notice of this plant, see page 121.

CHAPTER IV.

Laying Lands Down to Grass.

In order that the roots of the grass plants may penetrate to such a depth below the surface as to be out of danger from the effects of heat and evaporation during the summer, a good depth of mould is requisite; and, on this account, it is better that the lands designed for grass, especially where they are to be preserved in a permanent state of sward, should incline in some degree to moisture, or be rather retentive of it, so as to keep that humidity which is essential to the healthy and vigorous growth of plants, without running the risk of being destroyed by putrefying at the roots, from too much stagnant water enveloping them. On this principle, it is chiefly that the more light and dry descriptions of soil are better adapted to the production of grain than for that of permanent grass.

In the laying down of lands to grass, the plants must be suited to the quality of the soil, as some delight more in moisture than others; some succeed the best in clayey soils, others in those of a loamy kind; some on such as partake of the nature of peat, and a few in the calcareous sort.

As grasses vary materially in their manner of growth, there should be a combination of those circumstances, in order to constitute good meadows, and also to contribute as much as possible to the support of live stock.

The different grasses which compose the produce of the richest natural pastures in England are from from twenty-six to thirty in number, and are fully described in the first part of this work. From the spring till the end of Autumn there is not a month but what constitutes the particular season of luxuriance of one or more of these grasses; hence proceeds the constant supply of rich, succulent herbage throughout the whole of the season, a circumstance which but seldom or never happens in artificial pastures, where the herbage consists of two or three plants only.

If the best natural pastures be examined with care during various periods of the season, the produce will be found to consist of the following plants:

1. Meadow Foxtail (Alopecurus Pratensis), May.
2. Tall Oat Grass (Arrhenatherum Avenaceum), May.
3. Sweet Scented Vernal (Anthoxanthum Odoratum), May.
4. Annual Spear Grass (Poa Annua), May.
5. Orchard Grass (Dactylis Glomerata), beginning of June.
6. Perennial Rye Grass (Lolium Perenne), beginning of June.
7. Italian Rye Grass (Lolium Italicum), beginning of June.

8. Sheep's Fescue (Festuca Ovina), beginning of June.
9. Hard Fescue (Festuca Duriuscula), beginning of June.
10. Meadow Fescue (Festuca Pratensis), beginning of June.
11. Quaking Grass (Briza Media), beginning of June.
12. Woolly Soft Grass (Holcus Lanatus), beginning of June.
13. Wood Meadow Grass (Poa Nemoralis), beginning of June.
14. Floating Glyceria (Glyceria Fluitans), beginning of June.

White Clover (Trifolium Repens), beginning of June.

The above grasses afford the principal herbage in the spring, and also a great part of the summer produce.

15. Timothy Catstail (Phleum Pratense), July.
16. Kentucky Blue Grass (Poa Pratensis), July.
17. Rough Stalked Meadow (Poa Trivialis), July.
18. Fowl Meadow (Poa Serotina), July.
19. Red Top (Agrostis Vulgaris), July.
20. Crested Dogstail (Cynosurus Cristatis), July.
21. Meadow Oat Grass (Avina Pratensis), July.
22. Yellow Oat Grass (Avina Flavescens), July.
23. Downy Oat Grass (Trisetum Pubescens), July.
24. Tall Fescue (Festuca Elatior), July.
25. Nerved Manna Grass (Glyceria Nervata), July.

Which yield produce principally in summer and autumn.

Flat Stalked Poa (Poa Compressa), August.

Fiorin Broad Leaved Bent (Agrostis Stolonifera), August.

Yarrow (Achillea Milleafolium), August.

Which vegetate with most vigor in Autumn.

The preparation of land for grass seeds is of material importance to the success of forming good grass lands. From the fibrous nature of the roots of the grass plants in most cases, and the diminutiveness of the seeds, it is necessary that lands which are intended to be laid down to a state of sward should be always brought into as fine a state of pulverization and mellowness as possible, before the seeds are sown; for the seeds can neither be sown with so much regularity, nor vegetate in so equal a manner, nor extend their roots and establish themselves at first so effectually in the land, when the surface mould is in a clotted, lumpy state. Besides, a rough, uneven surface will require a much greater quantity of seed than land with a dry finely pulverized, smooth surface.

A chain harrow, or a grass one, should be used when seeds are not drilled in. And if any doubts exist about the quality of the seed, a much greater quantity than is recommended should be sown.

CHAPTER V.

GRASS SEEDS.—*Selection, Mixture and Sowing of.*

For want of distinguishing and selecting grasses for seed, the Farmer in many instances, fills his pas-

tures with weeds, or bad and improper grasses, when by making a right choice, after some trials, he might be sure of the best grass, and in the greatest abundance that his land admits of.

Whether raising seeds for his own use or for sale to seedsmen, too much particularity cannot be observed by the Farmer. How often have farmers taken seeds indiscriminately from their own hay lofts and barn floors, or sent to their neighbors for a supply, by which means, besides a certain mixture of all sorts of rubbish (which must necessarily happen,) if he chance to have a large proportion of good seeds, it is not unlikely but that which he intends for dry land may come from moist, where it grew naturally, and the contrary.

The principal seedsmen of our large cities who purchase their supplies from farmers, have too much respect for their own and the characters of their respective establishments, to sell, knowingly, worthless or defective seeds, consequently the blame must rest on the seed grower who furnishes other than the choicest and most valuable seeds to them.

Grasses of the best kind cannot be collected at too great an expense. If a farmer would be at the pains of separating a pint of the different kinds of grass seeds, and take care to sow them separately he would have wherewith in a very little time to stock his farm properly, according to the nature of each soil, and might at the same time, spread these seeds distinctly over the country by supplying the seedsmen.

As a mixture for rich and superior soils, I have selected the following grasses as being superior to all others in nutritive qualities, early growth, produce,

reproductive powers, permanency in the soil, and the facilities they offer for their propagation by seed. The proportions in which the seeds of the different species should be mixed for permanent pasture:

	lbs.
Orchard Grass (Dactylis Glomerata)	24
Meadow Foxtail (Alopecurus Pratensis)	10
Meadow Fescue (Festuca Pratensis)	28
Sweet Scented Vernal (Anthoxanthum Odoratum)	5
Rough Stalked Meadow (Poa Trivialis)	30
Timothy (Phleum Pratense)	15
Tall Oat Grass (Arrhenatherum Avenaceum)	5
Hard Fescue (Festuca Duriuscula)	20
Crested Dogs Tail (Cynosurus Cristatus)	26
Nerved Meadow Grass (Glyceria Nervata)	10
Wood Meadow Grass (Poa Nemoralis)	15
Fiorin (Agrostis Stolonifera)	5
Rye Grass (Lolium Perenne)	25
Italian Rye Grass (Lolium Italicum)	20
White Clover (Trifolium Repens)	15
Alsyke Clover (Trifolium Hybridum)	5
Red Clover (Trifolium Perenne)	12
Yarrow (Achillea Millefolium)	4

The proper quantity of grass seeds to sow per acre is a point of the greatest importance as regards to the expense of the seed and the speedy formation of the most valuable sward. The circumstances of soil, tilth and weather, at the time of sowing, all influence in a great degree the successful vegetation of the seed. Should less seed be sown than is sufficient to furnish every part of the soil with plants of grass, a proportionate loss of time, labor and land will be suffered. Minute vacancies of plants in a recently made past-

ure, or in a field of seedling grasses may to general observation, appear insignificant or escape observation altogether, but if these apparently minute deficiencies which occur over the surface of an acre be calculated, a difference perhaps of from ten to fifteen per cent in the produce will be found to exist between a perfectly furnished surface of land, and one where the deficiencies of plants are so minute as scarcely to be perceived.

In the most productive natural pastures no deficiencies of plants are to to be found, every part of the surface is closely interwoven with plants and not as in pastures artificially formed, of one or two species of grass only, where the surface is merely shaded or covered by the foliage of the comparative thinly growing plants.

As already stated in the preceeding chapter, a rough, uneven surface will require a much greater quantity of seed than land with a dry, finely pulverized, smooth consolidated surface.

If the surface is wet at the time of sowing, a greater quantity of seed will be required than otherwise would be neccesary.

The seeds of most of the essential permanent pasture grasses are so small and light as to be readily taken up in clumps by the harrow or roller passing over a damp surface. It has been ascertained by carefu experiments made by George Sinclair, that the smaller the number of different species of grasses that are combined together in a pasture, the greater is the deficiency of plants on any given space of land; this is an important fact to be considered in coming to a just conclusion respecting the proper quantity of grass seeds which should be sown on a given space

of ground so as to furnish the surface of it at once with the just sufficiency of plants.

When an excess of grass seeds is sown, the seeds in general all vegetate, but the plants make little if any progress until, from the want of nourishment to the roots and the confined space for the growth of the foliage, a certain number decay and give the requisite room to the proper number of plants, and that will be according as there are a greater or less variety of different species combined in the sward.

Having ascertained the number of grass seed contained in a given measure or weight of such seed and comparing these with the number of square feet or inches on the surface of an acre of ground the results will show the degree of closeness in which the plants or grasses will stand from the use of any given measure or weight of seed.

According to calculations made by George Sinclair with the seeds of most of the above grasses and plants mixed in the different proportions, before stated, he ascertained that one bushel of such mixtures of seeds sown on an acre of land would afford but two seeds to every square inch, while the most productive natural pastures examined by him had seven plants to every square inch.

Assuming that this statement is in the main correct, it would take at least three bushels of the mixture to seed an acre of land without a grain crop. Approximating this seeding, I will give it a more comprehensive and practical form, by giving the number of pounds of the seed of each grass required per acre, viz.:

	LBS.
Orchard Grass (Dactylis Glomerata).....	6

Meadow Foxtail (Alopecurus Pratensis)	2
Meadow Fescue (Festuca Pratensis)	2
Sweet Scented Vernal (Anthoxanthum Odoratum)	1
Rough Stalked Meadow (Poa Trivialis)	2
Timothy (Phleum Pratense)	3
Tall Oat Grass (Arrhenathrum Avenaceum)	1
Hard Fescue (Festuca Duriuscula)	2
Crested Dogstail (Cynosurus Cristatis)	4
Nerved Meadow Grass (Glyceria Nervata)	2
Wood Meadow Grass (Poa Nemoralis)	2
Fiorin (Agrostis Stolonifera)	1
Perennial Rye Grass (Lolium Perenne)	5
Italian Rye Grass (Lolium Italicum)	5
White Clover (Trifolium Repens)	4
Red Clover (Trifolium Perenne)	3
Alsyke Clover (Trifolium Hybridum)	1
Yarrow (Achillea Millefolium	1
	47

This will give 47 pounds per acre, which is a liberal seeding, and leaves a margin for worthless seeds, imperfect sowing, etc.

Keeping in mind the importance of selecting such species as blossom at different periods from May to September. For rich, loamy soils, the following mixture is a suitable one:

	LBS.
Orchard Grass	8
Meadow Foxtail	3
Sweet Scented Vernal	2
Meadow Fescue	2
Tall Oat Grass	2

Kentucky Blue Grass	4
Perennial Rye Grass	5
Italian Rye Grass	4
Red Top, or R. I. Bent	1
Timothy	4
Rough Stalked Meadow	2
Perennial Clover	3
White Clover	5
	45

This quantity is for an acre sown separately When sown with a grain crop, 30 pounds of the mixture may be used.

Third mixture for permanent pasture :

	LBS.
Orchard Grass	6
Meadow Foxtail	4
Hard Fescue	3
Meadow Fescue	2
June Grass	3
Perennial Rye Grass	6
Italian Rye Grass	4
Timothy	2
Yellow Oat Grass	2
Tall Oat Grass	2
Rough Stalked Meadow	2
Sweet Scented Vernal	2
Crested Dogstail	2
Perennial Clover	2
White Clover	4
	46

This is an excellent mixture for rich, loamy soils.

Fourth mixture for permanent pasture:

	LBS.
Red Top	10
Yellow Oat Grass	4
Downy Oat Grass	4
Sweet Scented Vernal	1
June Grass	4
Hard Fescue	3
Crested Dogstail	4
Quaking Grass	2
Alsyke Clover	4
Shamrock Clover	3
Suckling Clover	3
Rib Grass	4
Yarrow	1
	47

Nearly all those grasses are natural or indigenous to light, sandy or gravelly soils, and are the most suitable ones for sowing on such.

Fifth mixture for permanent pastures much shaded with trees:

	LBS.
Orchard Grass	10
Wood Meadow Grass	6
Rough Stalked Meadow	4
Sweet Scented Vernal	2
June Grass	6
Hard Fescue	3

Timothy	3
Perennial Red Clover	3
White Clover	4
	41

Mixture for permanent lawns:

	LBS.
Kentucky Blue Grass	6
Sweet Scented Vernal	2
Red Top, or R. I. Bent	1
Meadow Foxtail	1
Hard Fescue	1
Meadow Fescue	2
Orchard Grass	2
Timothy	1
Yellow Oat Grass	2
Perennial Rye Grass	3
Italian Rye Grass	5
Tall Oat Grass	4
Perennial Red Clover	4
White Clover	5
Yarrow	1
	40

In lawn mixtures as in permanent pasture ones, it is necessary to have the spring and summer flowering grasses in order to preserve a luxuriant and fine appearance throughout the season of verdure.

Mixture for marshy grounds:

	LBS.
Fiorin	6
Tall Fescue	5

Red Top	4
Fowl Meadow	6
Floating Glyceria	4
Reed Canary Grass	2
Rough Stalked Meadow	5
Timothy	5
White Clover	4
	41

The foregoing mixtures will serve as a basis, in n connection with the study of the character, &c., of the grasses, for the making up of any desired mixture which a farmer may require.

The advantages derived from sowing a number of species of grasses, compared with sowing only one or two in mixture, is so self evident from reasons already given, that it should be supposed few farmers could be found to advocate the latter practice. But unfortunately for the advancement of grass culture, there are those and their name is legion who still maintain the sufficiency of one or two species.

At the present time in England, half of the arable land in the Kingdom is supposed to be under meadow and pasturage. The greater part of this land is rented to farmers at extravagant prices.

Notwithstanding which their system of Grass culture embraces the circle of the useful grasses, from the towering Timothy to the modest little Poa Annua all (nearly) alike receive the fostering care of the husbandman, who is well repaid by this imitation of nature in the speedy formation of a thick and beautiful sward, producing a sweet and varied herbage grateful to the tastes of his animals, permanent

in its duration and the admiration of every tourist who travels through that well cultivated and beautiful country.

As C. L. Flint in his valuable treatise remarks:

"The range of climate of the United States is so extensive, embracing, we may almost say the tropical heat on the one hand and the short summer and severe winters of the Canadas on the other, that the grasses adapted to one region would not even succeed in another. Some grasses which are eminently adapted to sandy soils of a moist climate will not grow on similar arid soils in a drier climate and under a hotter sun."

Every allowance therefore must be made in favor of this country as regards the general appearance of both in the show of artificial meadow and pasture lands. But I fail to perceive the advantages English farmers have over those of New York state in either soil or climate in the cultivation of grasses, notwithstanding the extremes of heat and cold experienced here compared with England. In general the weather experienced here during the spring and fall seasons is superior to what prevails during the same seasons in that country. Vegetation here is more rapid. The land here is more easily cultivated and brought quicker into a proper condition for the reception of seeds than the heavy clay lands of England.

Several of the finest grasses now being cultivated extensively in both countries are natives of this.

Timothy and Orchard grass both flourish here, under circumstances that would be attended with only partial success there. In general the crops of Timothy, Orchard grass and Red clover raised in

this state (N. Y.) are not excelled in any part of the United Kingdom.

I am satisfied from experience that others of the valuable grasses will thrive under proper management equally as well here as in England. It is also an admitted fact that though grasses grown in a moist and equable climate may appear more rich and luxuriant, the nutritive qualities of grasses grown under greater heat and a drier climate are undoubtedly superior. It is therefore evident that we must attribute the attractive appearance of the artificial meadows and pastures of England over those of New York state to other causes than that of soil and climate.

In conclusion I will remark that the subject of grass culture being one of national importance, and regarded as the true basis of agricultural wealth and prosperity to the country, has always been strongly advocated by the foremost men of all classes. The illustrious Jefferson, who aided both by example and writings; the venerable and philantrophic Judge Peters, of Pensylvania; by the writings of that excellent and distinguished pioneer of agricultural weeklies, J. S. Skinner, of Baltimore; Judge Bue and his worthy successors, L. Tucker and son of Albany; the indefatigable C. Flint, of Massachusetts, whose writings are invaluable; and by the examples and writings of the noblest men in the country of the present day, whose efforts to beautify and enrich the most favored country in the universe will always receive my humble but sincere and hearty co-operation.

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ERRATA.

By an oversight, this latter portion of the article on Italian Rye Grass was omitted on page 34. It will be seen by a comparison of the analysis of this grass with that of Timothy in a dried state, that they are nearly equal in every respect. An important fact, and one which highly recommends it to the notice of American farmers. Although moist, fertile loams are best adapted to this grass, it will grow on various soils equally as well as Timothy. It has far exceeded Timothy with me this season, both grown on the same plot. The Perennial Rye grass has fully equalled Timothy in every respect, both fairly tested by me this season. For a separate seeding from 21 to 28 lbs. of seed per acre, of Italian Rye grass will be required, less if sown with a grain crop. It is not advisable to sow red clover with it, although 2 or 3 lbs. per acre of either wheat or clover would not be objectionable. The seeds of this last weigh 15 lbs. per bushel.

On fourth line from the bottom for flower read flourish, page 27. Eighth line from the top for on read an, on page 43. Fourth line from the foot for came read come, on page 43. Second line from the top for fellow read fallow, on page 44. Last line

foot of page for Compassa read Compressa, on page 45. Twelfth line from the top for Trivalis read Trivialis, on page 49. Tenth line from bottom for Tanton read Taunton, on page 59. For wooly (running Title) read Woolly, on page 62 and 63. On first line at top for irriagated read irrigated, on page 70. For running Title Glaceria read Glyceria, on page 72. On the 16th and 17th lines from the top read for a separate sowing 20 to 25 lbs per acre will be required, on page 86. For running Title Alaskye clover read Alsyke, on page 93, 94, and 95. For running Title Btrnet, read Burnet, on page 114. For 11 Brachyelytrum read 12, on page 146. For No. 6, Species Atterniflora read Alterniflora, on page 152. For No. 2 Species Trefolius read Brevifolius. On fourth line from foot for Pensylvana read Pensylvanica, on page 166. On fourth line from top for Repians read Repans, on page 173. On fifth line from foot for Futanst read Nutans, on page 175. On first page from top for Avena read Ovina.